AGRICULTURAL *Chemicals*

IN THIS ISSUE:

- Fertilizer Economics
- Quality Control
- Salesmen Survey
- New Plant and Process
- Beetle Control
- Pesticide Residues
- Orchard Spraying
- APPLICATOR SECTION

AUGUST, 1960

"Tell me again that part about 'you're beautiful'"

"You're beautiful because your colors are bright —and you're so loaded with that certain perfection Chase always gives!" "That certain perfection" is really a host of little details that Chase never overlooks. For instance, every Chase plant employs an "Ink Man," just to keep constant watch over hundreds of different hues, and to help Chase's skilled color-printing craftsmen put them to the very best use. All this so your products go to market in the most inviting way possible! As for *economy* and *utility*... these are an integral part of every Chase Bag. For facts about bags for any purpose, call your Chase Man, or write us.

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"WE HAVE BUT TWO PRODUCTS . . . POTASH AND SERVICE"

FRED ARNOLD
is P.C.A.'s Sales Representative for Virginia, North Carolina and South Carolina. He received his education at the University of Alabama and Yale University, in addition to many years of experience in sales and management, all enabling him to better serve the fertilizer industry.

JOE SCROGGS
is P.C.A.'s Sales Representative for Tennessee, Western North Carolina and Georgia, has attended Piedmont College and received a B.S. in agriculture from the University of Georgia. Also qualifying him for his job are years of experience in agricultural chemicals and the teaching of vocational agriculture.

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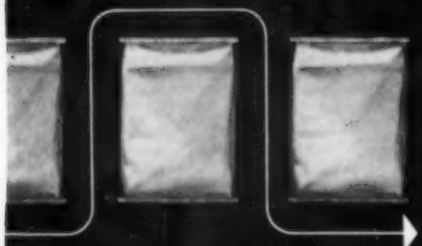
in the last two years over 210 multiwall users cut their packaging costs through a UNION-CAMP



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This Month's Cover

John C. Denton, president of Spencer Chemical Co., and Thomas W. Childs, president of Southwest Potash Corp., are shown following the signing of a contract under which Southwest Potash purchased 32 acres of land in Vicksburg, Miss., from Spencer. Property will be used to build a plant to produce nitrate of potash and chlorine by a new process. Story on page 35.

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AGRICULTURAL *Chemicals*

ARTICLES

ECONOMIC SAVINGS IN FERTILIZERS 28
by F. W. Atkinson
CLOSER FORMULATION CONTROL 30
SURVEY OF SALES PERSONNEL PRACTICES 32
NEW POTASSIUM NITRATE PROCESS AND PLANT 35
CONTROL OF WHITE FRINGED BEETLE 36
by Hiram C. Young
CHEMICAL RESIDUES 40
by W. L. Popham
NEW MITE-CONTROL METHOD 50
by Harvey J. Sutton
APPLYING WINDBORNE AEROSOLS 53
by A. H. Yeomans

FEATURES

IN THE SPOTLIGHT THIS MONTH 11
PRODUCTION ROUND TABLE 43
FERTILIZER VIEWS AND NEWS 47
by Vincent Sauchelli
THE AGRICULTURAL APPLICATOR 49
PEST ROUNDUP 57
by Kelvin Dorward
WASHINGTON REPORT 58
by Donald Lerch
THE LISTENING POST 61
by Paul Müller
INDUSTRY NEWS 62
EQUIPMENT AND BULLETINS 84
INDUSTRY CALENDAR 86
PROFESSIONAL DIRECTORY 97
CLASSIFIED ADVERTISING 99
ADVERTISERS INDEX 101
TALE ENDS 102

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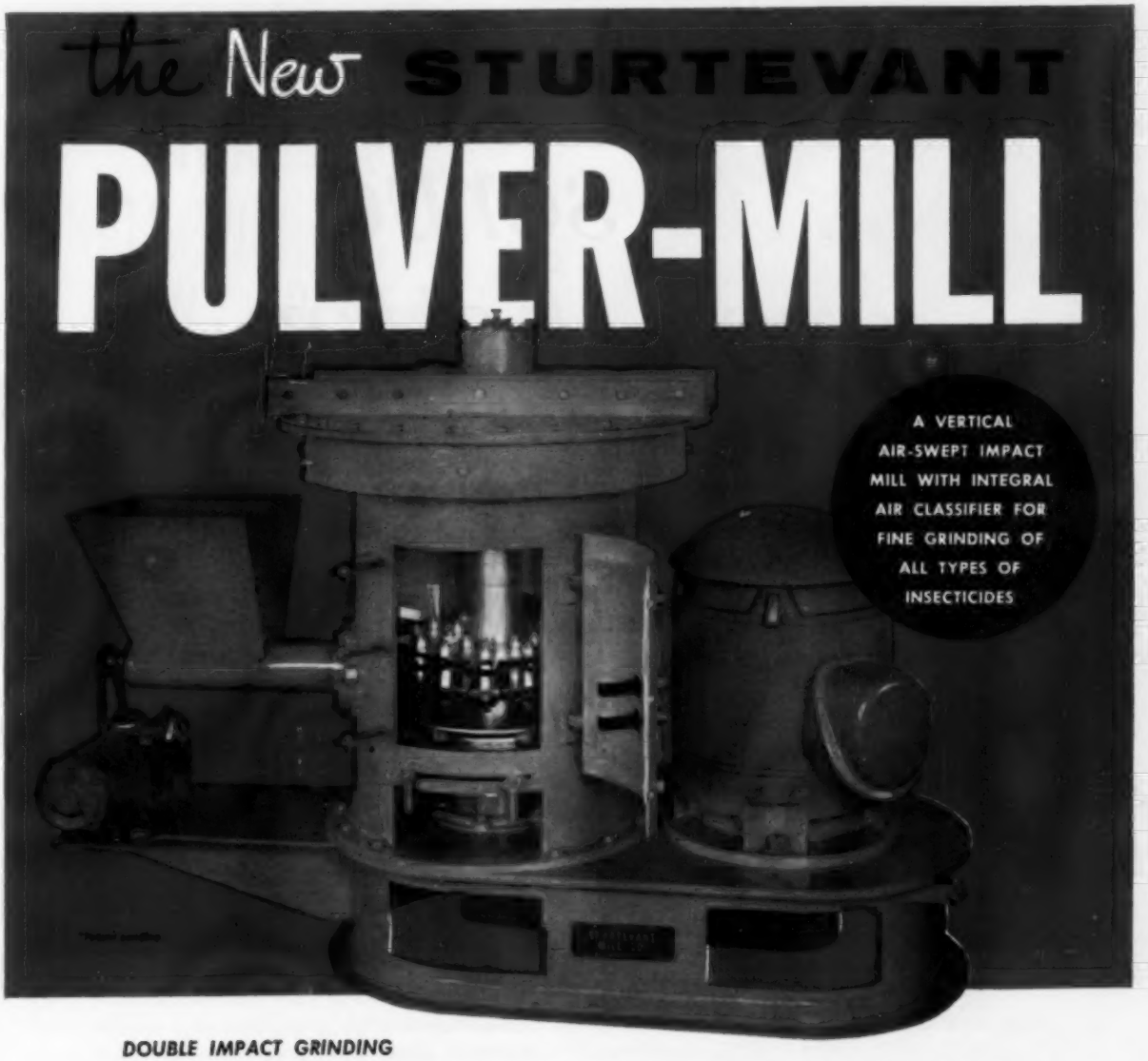
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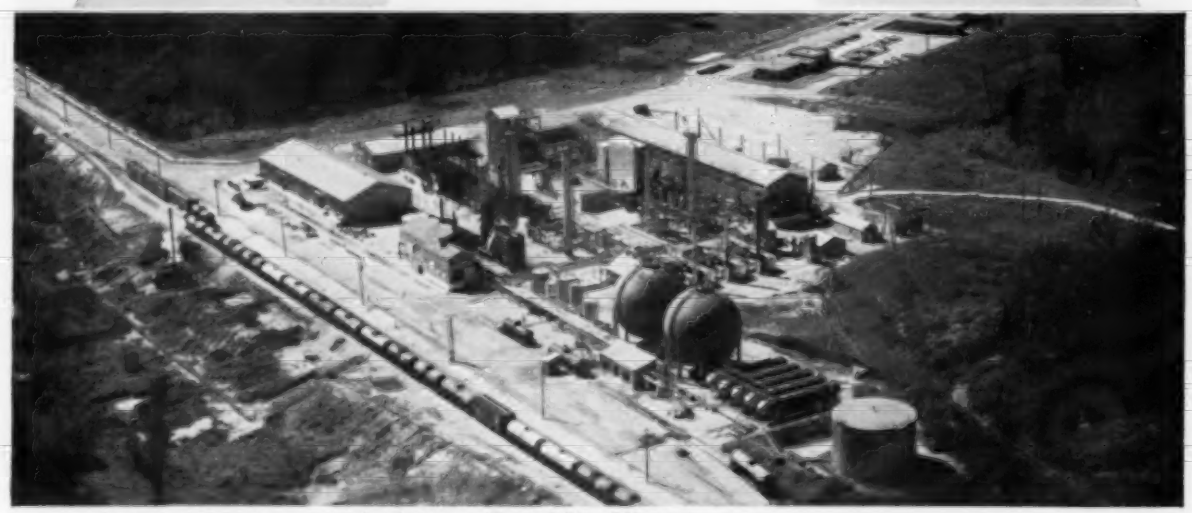

● Armour's modern ammonia plant near Crystal City, Missouri

For over sixty years, Armour has been serving American Agriculture; supplying the ever-growing demand for Armour and Vertagreen brand complete fertilizers by farmers and home gardeners. For more than a decade, we have served the fertilizer industry with phosphate products from our modern phosphate facilities in Bartow, Florida.

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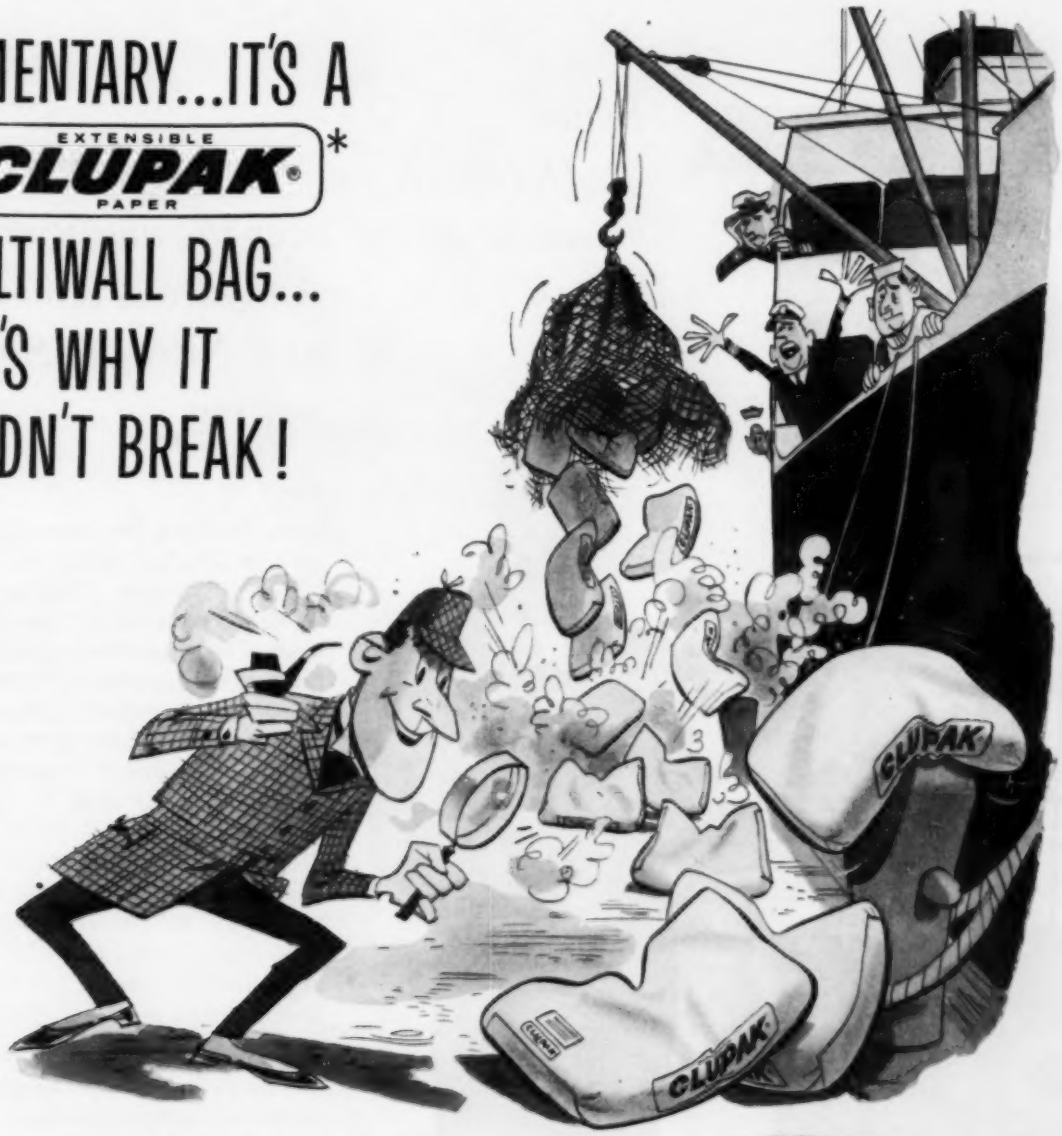
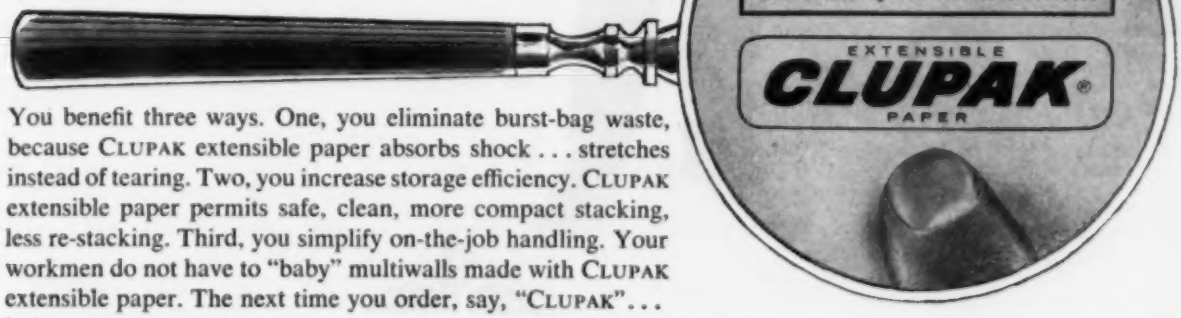


New CLUPAK extensible paper makes other papers old-fashioned . . . makes multiwall bags that stretch to take strain . . . absorb shock that causes bag damage. This increased toughness allows multiwall sack users to increase strength yet decrease the number of plies with resulting economies. Specify CLUPAK extensible paper multiwalls the next time you order.



You benefit three ways. One, you eliminate burst-bag waste, because CLUPAK extensible paper absorbs shock . . . stretches instead of tearing. Two, you increase storage efficiency. CLUPAK extensible paper permits safe, clean, more compact stacking, less re-stacking. Third, you simplify on-the-job handling. Your workmen do not have to "baby" multiwalls made with CLUPAK extensible paper. The next time you order, say, "CLUPAK"... before you say paper.

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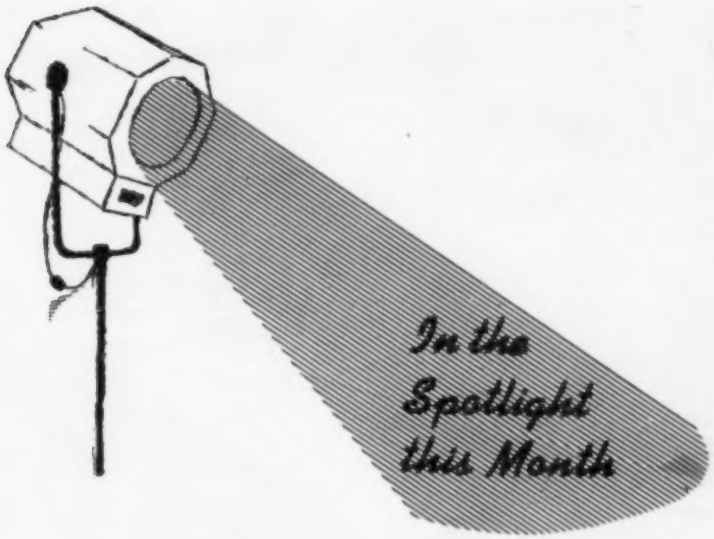
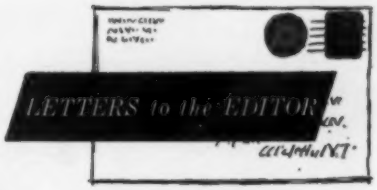


- **Fertilizer Economics** . . . There are several ways of "saving" in making fertilizer purchases. One farmer points to the wasted investment in sand and other inert fillers in some fertilizer grades, — and the even greater waste when this loss is interpreted in terms of potential earning power (if the money had been wisely invested in actual plant food). Page 28.
- **Quality Control** . . . The cost of over-formulation in the fertilizer industry is estimated at some 8 million dollars. Studies indicate this loss can be substantially reduced through: closer manufacturing supervision; uniform materials; uniform tolerances; and more accurate sampling and analytical procedure. Page 30.
- **Salesmen Survey** . . . A nation-wide survey of companies in the agricultural chemicals industry has just been completed by *Agricultural Chemicals*. The results of the survey disclose the prevalent practices among firms with regard to compensation and responsibilities of their sales personnel. Page 32.
- **White-Fringed Beetle Control** . . . Soil treatments of several modern insecticides will give complete mortality of white fringed bettle larvae for several years. Residues from foliar applications of some chlorinated hydrocarbon insecticides for control of other insect pests accumulate in sufficient quantity in the soil over a period of years to give economic control of the beetle. Dinitrocyclo hexylphenol, DDT or gamma BHC are satisfactory ovicides if egg masses are thoroughly wetted. Page 36.
- **Fertilizer Formulation** . . . Much time can be saved in making and changing fertilizer formulas by use of pre-calculated tables. Furthermore, the chance for error is greatly reduced, since proved figures in the tables serve as reference points. A series of such tables, how to prepare and use them are described in this article on formulation of granular fertilizers. Page 43.
- **The Pesticide Residue Question** . . . A USDA representative, citing the importance of chemicals in food production, but concerned uppermost with safety to the public, observes that "Chemicals are an essential production tool — We have the competence in this country to use them to great advantage without harm to anyone." Page 40.



To The Editor:

I've looked at your fine magazine from month to month, but haven't seen any information on new spray materials for grapes. Here we use the old and new ones such as bordeaux, ferbam, captan, but haven't been able to conquer black rot to date. The time of application doesn't influence our rise of rot very much; the same can be said for the amount of application. Are there any new chemicals in addition to the three which are worth a trial against grape diseases?

David Long
Mountain Top Nursery
Altus, Arkansas

Several investigators a year or two ago (reported in the Fungicide Tests for 1956) reported good rot control with Ziram. For cryptosporella dead arm in grape, they added DN 289 or L-S to ferbam and Bordeaux. Fungicide tests by investigators all over the country are compiled annually by the temporary advisory committee of the American Phytopathological Society. Reprints of these tests are available through Dr. A. B. Groves, Winchester Fruit Research Lab., Route #3, Winchester, Va.—Ed.

To The Editor:

I have misplaced several of my *Agricultural Chemicals* back copies. Thus, I am unable to find the name of a systemic insecticide produced in Japan. This compound was described in an issue of your magazine in 1959. Could you send me the name and address of the company or laboratory producing the insecticide.

E. F. Taschenberg
New York State Experiment Station
Geneva, New York

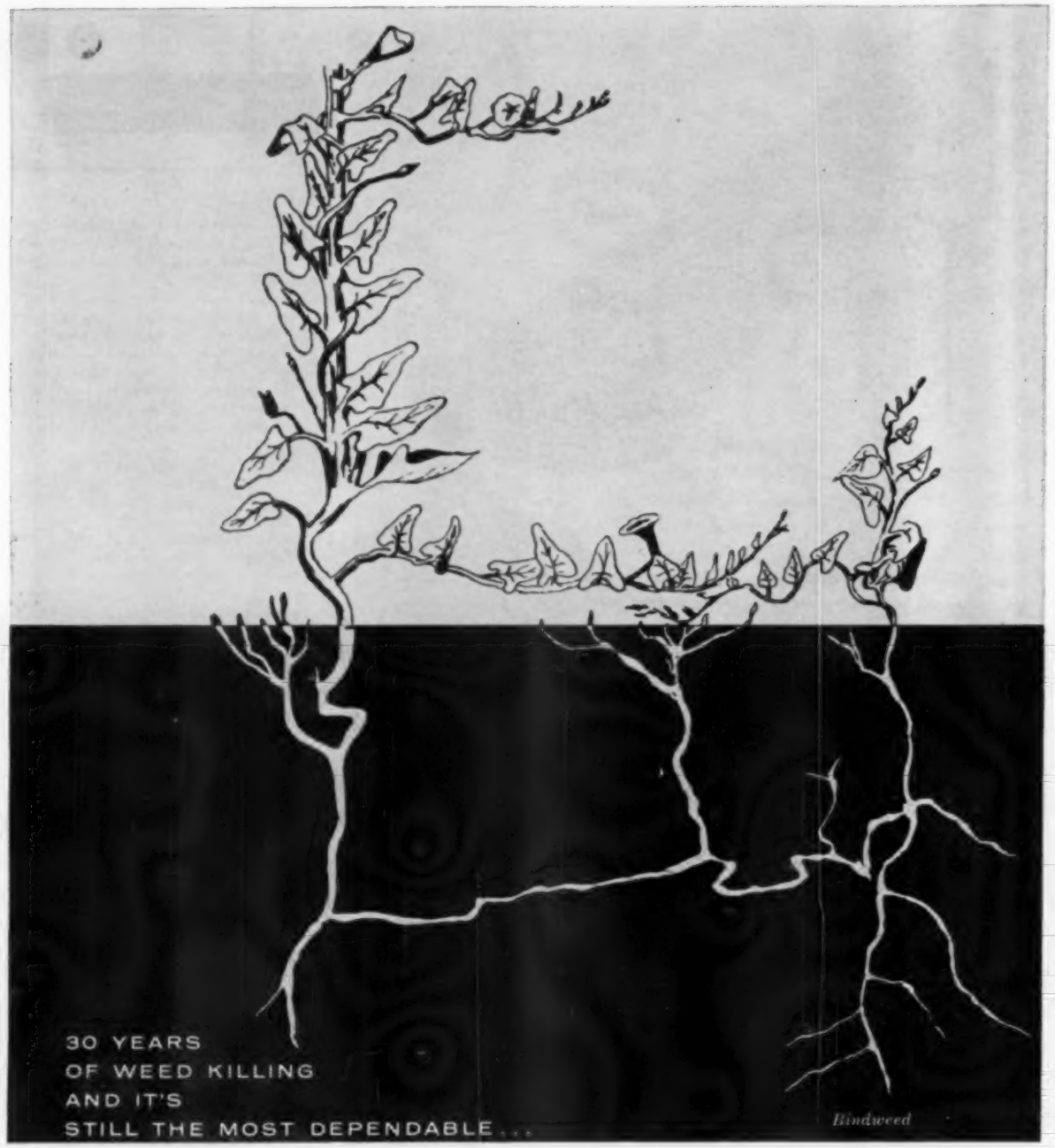
The compound is a fluoro acetamide, called "Fussol." It is made by Sankyo Company Ltd., Tokyo, and was described in an article in the July, 1959 issue of "Agricultural Chemicals."—Ed.

To The Editor:

Thank you for the publication of my letter. I would like to clarify one point, however. My interest in the subject raised by Mr. Baranowski (December 1959 issue of *Agricultural Chemicals*) is not in leaf miners, but the lowered efficiency of sprays when mixed,— and one example for it is the statement made by Mr. Baranowski that a mixed spray of DDT with parathion lowered the efficiency of parathion on leaf miners.

At first being only a suspicion, more and more evidence has shown up that

(*Continued on Page* 14)



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It kills them all.

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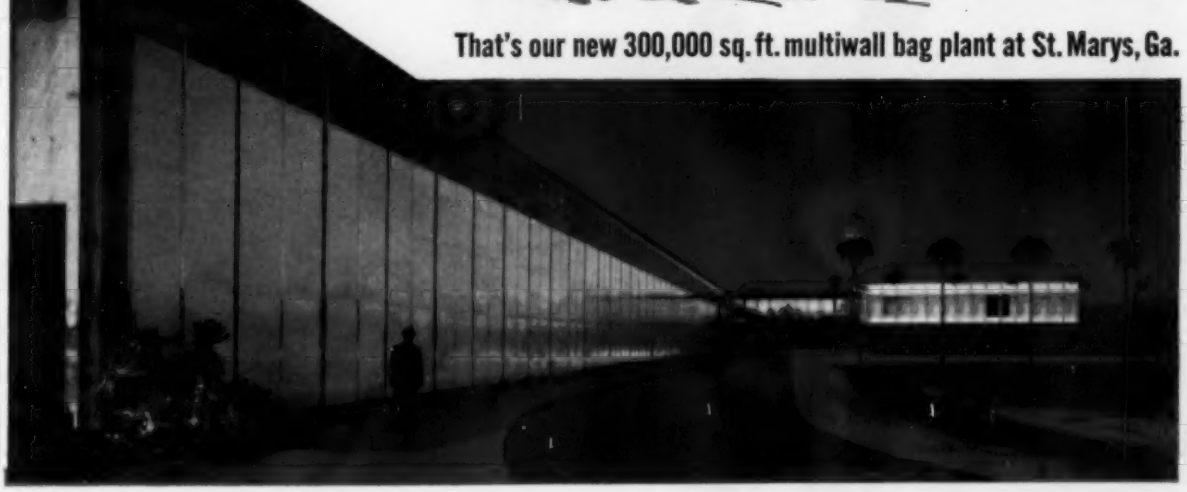

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*Trade Mark

Southwest Potash Corporation

LETTERS

(*From Page* 11)

apparently compatible materials are less efficient in mixed sprays, thus preventing accurate results.

Having already some information from laboratories, I am still looking for more. I will be obliged for any further information you can offer.

Harry Baumann
Meshek Dalia
Post Daliah, Israel

If any of our readers have found similar results in their studies, or wish to exchange information with Mr. Baumann, would they write directly to him, or to this column. The address for Mr. Baumann is complete as printed.
—Ed.

TO THE EDITOR:

We would like to obtain permission to reproduce the excellent article by G. M. Volk entitled "Urea Nitrogen and Sandy Soils" which appeared in *Agricultural Chemicals*. September, 1955, p. 41. We would like to distribute copies of this article to the sales and technical representatives of our company and anyone else who might be interested in this subject.

L. E. Craig
Grand River Chemical Division
Pryor, Oklahoma

•

Permission to reprint is granted. All we request is inclusion of the standard, reprint credit line.—Ed.

•

TO THE EDITOR:

We have seen a few issues of your magazine and have found it most interesting. We, therefore, take this opportunity in seeking your assistance and co-operation for the solution of our inquiry.

We intend to set up a pesticide formulating industry in Pakistan and are interested to import machinery and chemicals to formulate pesticides (insecticides and weed killers, etc.) both as liquid emulsion and dispersible powders/dusts. As you have world-wide contacts with the leading pesticides manufacturers, and also with such machine manufacturers who deal in formulating plants, we wonder if you would kindly either inform us of their names and addresses or forward our inquiry to them with a request to write to us direct.

It will not be out of place to mention here that as Pakistan is a small country we shall require formulating plants of small to medium size.

M. A. Rauf
AGRO-CHEMICALS
3, Dost Building
Chittagong, Pakistan

Any of our readers who are in a position to assist Mr. Rauf may write him directly at the above address, or, if they wish, we could forward any information to him.—Ed.

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At Sohio we concentrate on giving technical service that does more than solve formulation or mechanical problems. As you'll discover when you talk to the "Man from Sohio," we are sincerely interested in helping you in any way we can. To produce better products. To sell them at a good profit. To help you build your markets. One example is this year's Farm Progress Show. Every growing display of Sohigro Urea promotes and sells the complete fertilizer story. Your story is our story. That's why technical service at Sohio also has a flair for selling.

See the whole Farm Progress Show from Sohio's vantage point. Visit the corn fields where you'll see growing proof of the value of Sohigro Urea when used with complete fertilizers. See the bumper crops of hybrid corn produced by total fertilization. Sohio takes your story to farmers . . . to seed growers . . . to the farm press. See you at the Sohio exhibit.

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23-60

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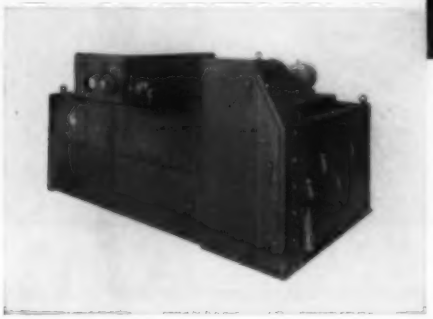
- blending or feeding dry ingredients . . . ammonia, rock dust, solid nitrogen, potash, super, triple-super, etc.



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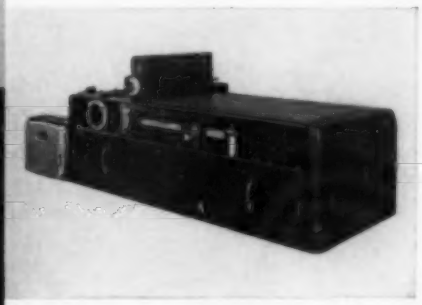
- proportioning acids to rock dust
- check-weighing incoming bulk ingredients
- checking recycle for process efficiency
- interdepartmental inventory checking



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High Accuracy — ± 1% by weight of set feed rate within range
Wide Range — provided by 100:1 variable speed transmission
Bulletin — 35-N62

MODEL 37-42P
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High Accuracy — ± ½% of max. weight (weigher); ± 1% by weight of set feed rate within range (feeder)
Wide Range — 10:1
Bulletin — 35.20A-1

MODEL 36-20
High Capacity — 0 to 10, 100, 500, 1000, 2000, 3000 lbs. per min.
High Accuracy — ± ½% of maximum rate
Wide Range — 10:1 (constant speed drive); 50:1 (variable speed drive)
Bulletin — 36-P1

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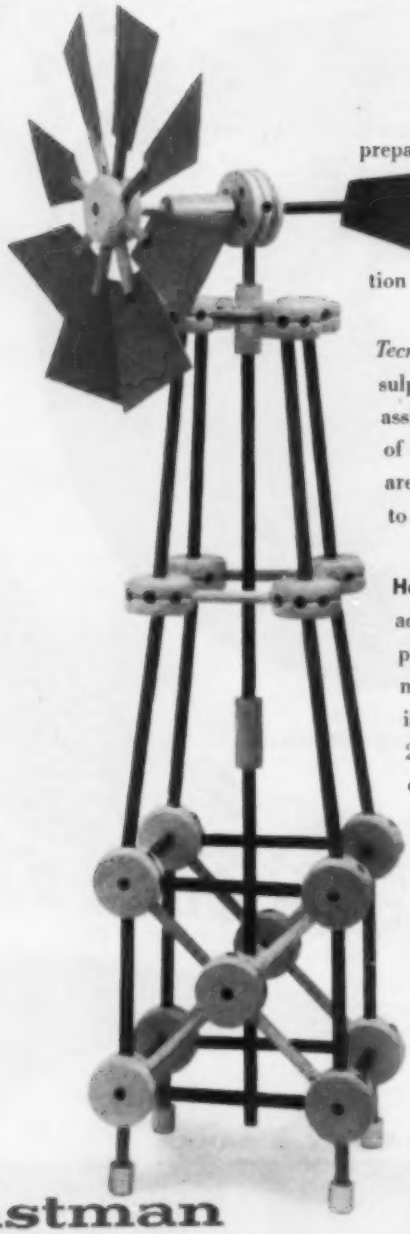

prepared for feed use—free-flowing, non-dusting, and granulated in a particle size comparable to that of other feed components. Protects vitamin content of feeds, improves pigmentation and protects chicks against deficiency diseases.

Tecmangam®. Contains 75-78% manganese sulphate. Completely soluble and readily assimilated, Tecmangam is an ideal source of manganese for feeds. In manganese-deficient areas, Tecmangam can be added to fertilizer to supply this essential element.

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propionic acid
n-butyric acid
isobutyric acid
2-ethylhexoic acid
ethyl alcohol
n-butyl alcohol
isobutyl alcohol
2-ethylhexyl alcohol
mixed octyl alcohols
isobutyronitrile
manganese sulphate (Tecmangam)
triethyl phosphate

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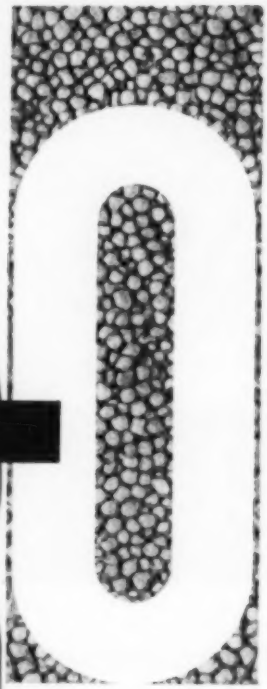

16-48-0

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Some formulations of ratios in higher analysis grades using DAVISON 16-48-0

Ratio Analysis	Pounds of Material Required			
	16-48-0	Ammo. Sul. (21%N)	Triple (46%APA)	Potash (60%K₂O)
1-1-1 14.4-14.4-14.4	602	917		481
1-2-2 11-22-22	917	349		734
1-4-2 8.5-34-17	1063		370	567
1-4-4 6.6-26.5-26.5	828		290	882

**Other higher analysis nitrogen materials (urea and ammonium nitrate) may be substituted in above formulations.*
Analysis in the more popular ratios, such as 12-12-12, 10-20-20, 6-24-12, 5-20-20, can be manufactured by the addition of granular dolomitic limestone or other materials.

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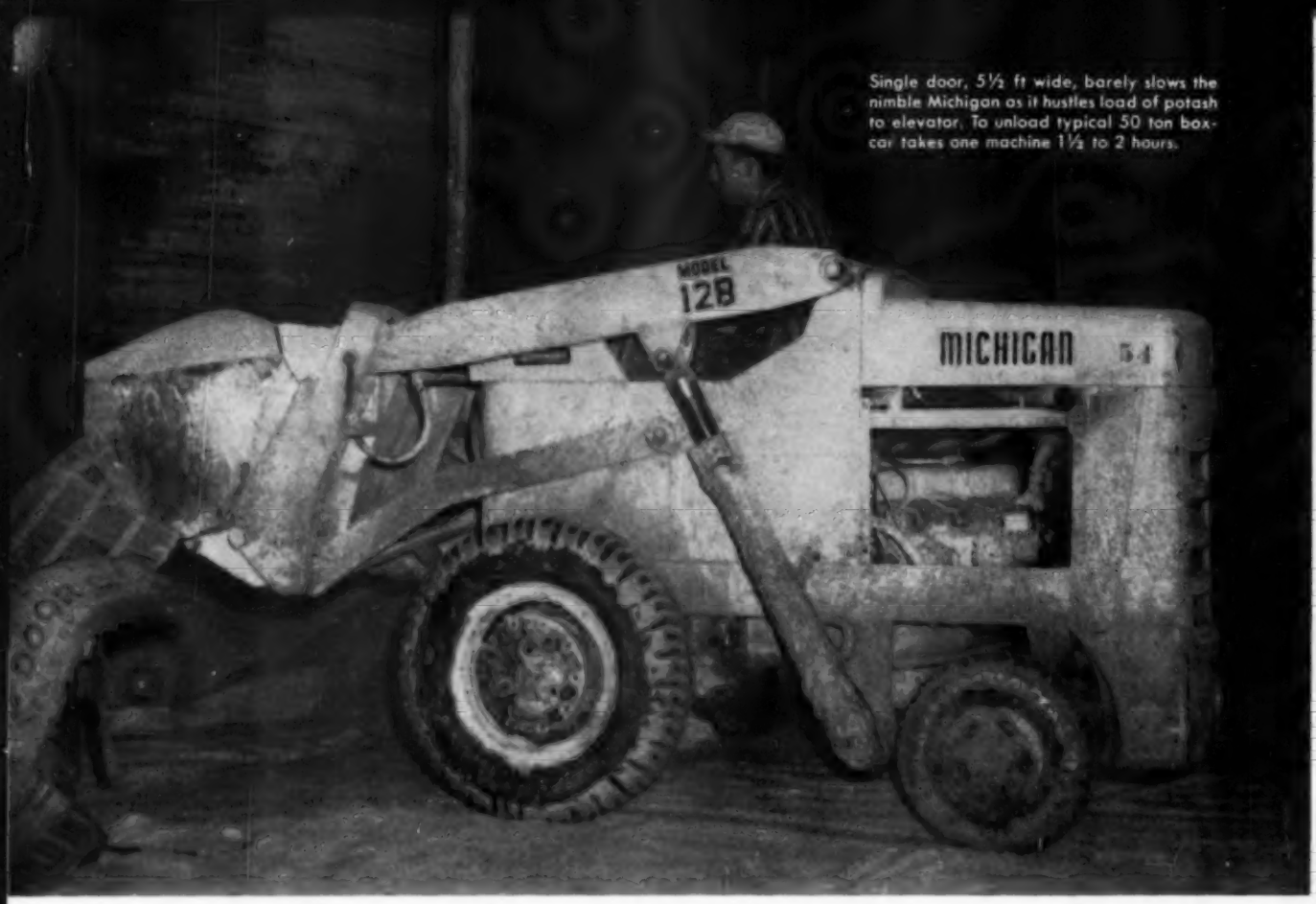

Single door, 5½ ft wide, barely slows the nimble Michigan as it hustles load of potash to elevator. To unload typical 50 ton boxcar takes one machine 1½ to 2 hours.

Smith-Douglass production manager reports:

"Michigans easy to operate, easy to maintain"

"Ease of maintenance . . . fatigue-reducing power steer . . . complete sealing against dust . . . these are the main reasons we bought our Michigan Tractor Shovels."

The speaker is Monroe C. Suderman, production manager of the Streator (Illinois) plant of Smith-Douglass Company Inc, Norfolk, Virginia.

Unload 50 ton boxcar in 1½ hours

One of this firm's *many* Michigan-equipped plants, the Streator operation uses their Michigans for a variety of material-handling assignments. Their Model 12B's—units with 3000 lb lift capacities and 16 cu ft buckets—spend about half their time moving potash, sulphate of ammonia, and triple super-phosphate from boxcars to elevators. Where travel distances are average (20 to 60 ft one-way) and car-loads typical (most materials are ordered in 50 ton lots), one Model 12B does a complete unloading job in 1½ to 2 hours. Bucket loads scale out at 800 to 1,000 lbs each.

Feed 25 tons TSP hourly

Another major 12B job involves feeding super-phosphate from storage piles to elevator. Unit output here, on one-way hauls of 25 to 250 ft, averages 25 tons per hour—all the plant can handle.

Handle cleanup too

The 44 hp Model 12B's keep busy elsewhere too in this fully-integrated, 260-man operation. Sometimes they deliver some of the 17 grades of finished products to packaging (from where it is shipped by bag and bulk to farm supply dealers throughout Illinois, Indiana, Iowa, and southern Wisconsin). Sometimes they clean around elevators. They haul re-work material. Push snow. Etc. Etc.

Versatility like this—*plus dependability*—are two of Michigan's *biggest advantages*. We'd like to show you, first-hand, how they can pay off *in your plant*. Choose from nine models, whatever size bucket you want (9 cubic feet to 10 cubic yards)—your Michigan Distributor will demonstrate. Call him to arrange time and place.

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As Cyanamid's "walking giant" scoops away overburden covering a rich phosphate deposit, the surveyor plans a system that will handle the huge amount of water needed to make slurry and move it to washing and grading plants

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Like all the men and women in Cyanamid's phosphate operation, his only business is phosphates for your mixed fertilizers

He's one of several hundred Cyanamid people who mine, process, research, deliver and service phosphatic materials for your acidulation and mixed fertilizer business. These people put Cyanamid's more than 40 years of phosphate experience into the kind of products and services you can use. Take advantage of both. Pick up your phone and call your Cyanamid representative.

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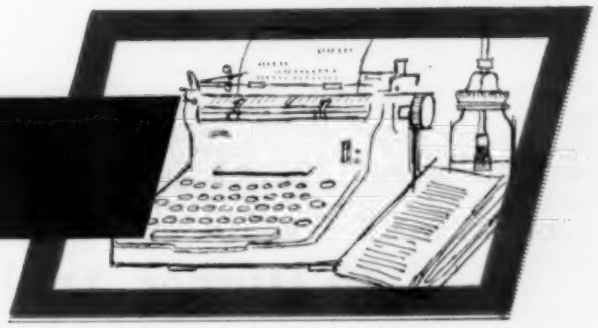
EDITORIALS



MUCH of the emphasis at the coming meeting of N.A.C.A. (scheduled for Coronado, California, Sept. 27-29) will be on safety of pesticides, we understand. Most insecticides, of course, are completely safe, and when used with normal, intelligent precautions can be counted on to make their tremendous contribution to protecting man, beast, his food and possessions against insect attack, without any serious hazard. The safety record of the industry is in general a good one, and one which will stand close comparison with that of any other industry turning out an end product of a comparable nature.

This good record, however, should not obscure the fact that some of the more toxic pesticides are occasionally used in a way that invites disaster. The California Agricultural Aircraft Association in a recent bulletin called attention to the fact that 34 pilots and mixers, who had been engaged in aerial spraying operations in that area recently were under treatment, as a result of failure to observe normal precautions while applying highly toxic phosphate pesticides. The situation was caught in time, and remedial treatment was started. Had it not been, there could have been a series of regrettable and completely unnecessary accidents.

In our opinion producers of some of these pesticides have by no means done all that they could or should do to minimize the chance of fatalities resulting from improper exposure. The job of educating the user and applicator to handle dangerous pesticides with respect is a never-ending one. Yet it is a job which producers of these products must undertake, and carry through continuously, if we are not to wake up some morning to face a whole series of needless, preventable fatalities.

We occasionally have the feeling that some firms in the insecticide business are willing to let their responsibility end with sale of the product. Perhaps they feel that application and safe use are not up to them. When they sell a highly toxic product, however, their obligation does not end with the sale. As we see it, their responsibility is not discharged until they follow through with an educational program which no user of the product can miss, hammering away month after month at the necessity for observing adequate precautions. And this they are not doing! The California incident cited above is direct evidence that there is still a major job to be done in teaching aerial applicators how to handle highly toxic pesticides with safety.

AN spite of the fact that the productive capacity of the American fertilizer industry is currently at an all-time high, the building and equipping of new fertilizer plants goes right on. This includes a number of giant new plants for the manufacture of basic fertilizer raw materials, as well as many new mixing plants turning out finished products. A recent survey by McGraw-Hill showed that during the first half of 1960 the cost of new plants contracted for to produce chemicals and fertilizers was $183,000,000, which was far ahead of most other industries.

This continuing upward trend in the industry's growth curve is a graphic demonstration that those with capital to invest have solid faith that fertilizer sales have by no means reached their peak level. There has long been general

(*Continued on Page* 81)

Economic Savings

In Higher Analysis Fertilizers

A South Carolina farmer urges elimination of those fertilizer grades which require large quantities of wholly inert material. "We cannot receive any return on money invested in sand in fertilizers," he says, and observes that the cost of filler in fertilizers delivered to farmers' premises (freight, bagging, taxes, storage, etc) amounts to $12 per ton. When viewed in relation to potential earning power (if this money had been invested in plant food), the waste in use of low-analysis mixtures becomes enormous.

by F. W. Atkinson
Hartsville, S. C.

IN this review of the "Economic Savings in Higher Analysis Fertilizers," I want to emphasize that I interpret this to mean grades which can be made from our normal materials available in this area (vicinity of South Carolina) without the use of wholly inert filler. This does not refer to what I term concentrated grades made from highly concentrated and premium cost materials, which greatly reduce the secondary elements normally found in our fertilizers such as sulphur, calcium, magnesium, etc. which are necessary to successful crop production. I think our objective should be higher analysis fertilizers as one important link in our total effort toward advancement of agriculture in our state.

It is my feeling that in the advancement of agriculture in South Carolina:

1. We need to increase the quality of our products as well as the yields per acre.
2. Also, improve the net profits of our farmers to provide a greater income and better life for our farm people, enabling them to share more fully in the economy of the United States.
3. The improvement in agriculture will have to be accomplished in several ways. Some such ways are improved farming practices such as soil fertility, good tillage, good seed, the best available fertilizers used in adequate quantity, and adequate pest control. At least this is something which we can, with the proper approach, accomplish right here in South Carolina. While Washington is involved in this agricultural problem (and in my opinion the farmer is not presently getting an enlightened and square deal from this source), I think there is reason to hope that this will improve soon.
4. I am not one who believes in grade concentration to the point of elimination of the secondary elements which are necessary in our agriculture. However, I do strongly feel that it is a shameful waste to have fertilizer grades which require large quantities of wholly inert material. Our farmers can normally expect to get $3 to $5 or more return per dollar invested in plant food, but we do not need and cannot receive any return on money invested in sand in fertilizers. The actual cost of this inert material in some grades of fertilizers is substantial, but when we view it in relation to potential earning power (if this money had been wisely invested in plant food) the waste becomes enormous.
5. I believe that if these data were presented to our farmers and others, showing the amount of sand or inert material in a few of our low grades, the farmers themselves would refuse to use such grades. And so, in my opinion, it is largely a matter of proper dissemination of the facts. I believe you are thoroughly aware of this, and so I have confidence that we are going to move forward in the future.

These are my personal views, developed through my experience of more than 30 years in farming and in the fertilizer industry.

I remember, and some of you do too, the low grades of 8-2½-1, 8-2-2, 8-3-3, etc. of the 1920's when we were still guaranteeing in the P-N-K order (and ammonia rather than nitrogen). These low grades were eliminated when our fertilizer law was changed to guarantee nitrogen instead of ammonia, and to state in the N-P-K order. I have been asked by interested people from time to time as to why grades which were considered high grade and good 10 to 20 years ago should be discarded or deleted from the authorized list. It is a good question, and one which needs to be answered for those not in the fertilizer business; or for those not in some other activity which normally keeps them posted on the advancing technology in chemicals which go into fertilizers. Generally speaking, the answer lies in the rising analyses of nitrogen, phosphorous, and potash materials. As an example, many of us remember the advance in analysis of nitrogen materials from 16% to 20½%, 30%, 40%, and to the present, when we have very satisfactory nitrogen solutions approximating 50% nitrogen. Also our superphosphate has advanced from 16/18% to approximately 20% and higher. And finally, we remember the 12.4% kainit, 20, 25, and 30% manure salts, 50% muriate and now muriate of potash of 60 to 62%. These advances have occurred during the past 30 years and are essentially the answer to the continuing up-trend in fertilizer grades. This up-trend is very necessary if our farmers are to receive the economic advantage of this advancing technology in fertilizer.

TABLE I

Tons	Grade	Approx. Lbs. Filler	Cost per Cwt.	Cost per ton Fertz.	Total Cost
*100,000	3-9-9	550	60¢	$3.30	$330,000
120,000	4-10-6	450	60¢	2.70	324,000
* 32,000	5-10-5	300	60¢	1.80	57,000
21,000	3-9-12	450	60¢	2.70	57,000
73,000	3-12-12	200	60¢	1.20	87,000
				TOTAL	$855,000

*These removed from the grade list 7/1/58 and 7/1/59 respectively: 3-9-9 to 4-12-12 and 5-10-5 to 6-12-6.

So, we have heard a lot of talk over the years about sand in fertilizers, and I have the impression that many people believe we have an ample supply of it, that it is of little or no expense in fertilizers, and therefore accept it as a necessary evil or as inevitable. We do have an ample supply of sand in South Carolina, but it is not inexpensive in fertilizers when we view it all the way from the sand pit to the farmers' premises in the fertilizer which he buys. I realize that the cost of sand or other wholly inert filler will vary moderately from plant to plant, but I am giving you here what I consider to be the approximate cost of it in fertilizers (basis per ton of this filler). At least this is a good example of it, and I do not think it is too far from the average cost in South Carolina.

	per ton
Cost plus freight to plant	$3.00
Labor unloading and manufacturing base	$1.00
Estimated cost of storage space in base goods	$1.00
Bags and tax	$2.50
Labor bagging and shipping	$1.00
Average delivery cost	$3.50
Total cost of filler in fertilizers delivered to farmers' premises	$12.00

You will observe that this is a cost of 60¢ per cwt. of filler, and generally speaking, a grade carrying 500 lbs. will have a cost of about $3.00 per ton for this inert material, 400 lbs. about $2.40 per ton of fertilizer, 300 lbs. about $1.80 per ton, etc.

Therefore, a farmer buying a grade of fertilizer containing about 500 lbs. of filler spends approximately $3.00 per ton of fertilizer for this inert material which can give him no return. Also he has lost potential earning power of $3.00 to $5.00 or more for each dollar of such expense invested in this inert filler.

I notice from the list handed to us of the six leading grades in South Carolina for each of the past 20 years, 15 have heretofore been deleted from the authorized grade list for the reasons I have already recited. I mention this to show you that this need to eliminate wasteful grades is not a new thing but a problem which we must continue to deal with effec-

(Continued on Page 87)

F. W. Atkinson was brought up on a farm in South Carolina and still engages in farming in addition to his employment in the fertilizer industry. His remarks, upon which this article is based, were made at a meeting of the Clemson College Fertilizer Advisory Committee in Columbia, S. C., May 31, 1960. Mr. Atkinson is a member of the committee.

A Long-Time Problem

Closer Formulation Control Goal Of NPFI Research Project

Over formulation in the fertilizer industry represents an annual loss of some 6 to 8 million dollars. The key to reducing this and other losses in fertilizer manufacture is closer control.

NPFI's Chemical Control Research Project, is just one of the current efforts designed to encourage the manufacture of more uniform fertilizer and thus reduce over-formulation. NPFI also sponsors annual conferences on chemical control problems and supports the efforts in this direction of the Fertilizer Industry Round Table and the Association of Official Agricultural Chemists.

A PROBLEM that has long vexed both fertilizer control officials and the fertilizer industry chemists is that of quality control. This is a long-time serious trouble spot which has not been licked yet.

The fact is that, to be on the safe side, fertilizer manufacturers over-formulate at an annual loss of an estimated 6 to 8 million dollars a year. From an industry point of view, figures of this magnitude are significant. They are even staggering.

The amount of money lost in overages is not a hypothetical figure. Let me give you a typical example in a state that has very competent chemical analysts and a well-equipped laboratory. In a recent annual report for this state, sales of mixed fertilizer exceeded 650 thousand tons. The difference between the manufacturer's guarantee and the actual dollar value was $1.31 per ton. Simple arithmetic will show that the manufacturers gave away approximately 850 thousand dollars in overages. Such a loss ought to be avoided.

In a further example from another state, the average per-ton value for fertilizer was listed at $60, based on manufacturer's guaranteed analysis. The average per-ton value, based on the state chemist's analysis, was $61.01, a difference of $1.01 per ton in overages. During this fiscal year, farmers bought more than 600 thousand tons, so another 600 thousand dollars was lost to already hard-pressed manufacturers.

We believe that the cost of over-formulation, as currently practiced by the industry, could be very substantially reduced:

1) *if* closer manufacturing supervision could be achieved.
2) *if* materials could be more uniform.
3) *if* tolerances could be more uniform, and
4) *if* sampling and analytical procedure could be made more accurate.

And, we are cooperating with you in trying to do something about it.

You have heard of the National Plant Food Institute's "Chemical Control Research Project." which is designed to encourage the manufacture of more uniform fertilizer and thus to reduce over-formulation. The success of this project will further enhance the professional prestige of the control chemists, and it will mean dollars saved.

"In devising fertilizer control procedures, the laws of physics appear to have been largely overlooked."
Paul T. Truitt

This article is taken from a talk presented by Mr. Truitt before the Association of Southern Feed and Fertilizer Control Officials, Gatlinburg, Tenn., June 21, 1960.

It is encouraging that the project, from the outset, has enjoyed the enthusiastic support of the Association of Official Agricultural Chemists and the Association of American Fertilizer Control Officials and the industry. So, we feel confident that we were on sound ground in undertaking a program of such promise.

To establish the ground rules and practical procedure, a task force was established, whose members were drawn from the Association of Official Agricultural Chemists and the Association of American Fertilizer Control Officials and from the fertilizer industry itself. This task force received practical advice from two of the Nation's better-known statisticians: Dr. A. J.

Duncan, of Johns Hopkins University, and Dr. W. Edwards Deming, of New York University. These two statisticians designed the experiment according to accepted statistical principles and practices.

This project may be considered as one of the most comprehensive studies yet made on sampling and chemical analysis of fertilizers. In making this statement, in no way do we wish to detract from the pioneer efforts of the AOAC.

We in the National Plant Food Institute consider ourselves fortunate in having the services of Dr. Vincent Sauchelli to coordinate our efforts in the field of chemical control. We feel that our friends and co-workers in the Chemical Control Division of the state governments recognize his manifold abilities and hold him in equally high esteem.

The preliminary work leading up to the procedure adopted for the Chemical Control Project took many days of conferences with members of the task force and others. The task force operated under the philosophy of "Be sure you're right, then go ahead." The research conducted under this project revealed strikingly the need for improving the precision and accuracy of all fertilizer control laboratories. Such result led to the further development of the Magruder Check Sample Series as a means of improving laboratory techniques. The Magruder Check Sample was first developed by some fertilizer industry chemists in the 1920's. It represents a pioneer effort at self-improvement. I am safe in saying that the Magruder procedure has been modernized by the Task Force by the addition of statistical principles, and today this procedure is the "bright hope" for better chemical control, both in the state and in industry laboratories throughout the United States.

Without going into too many details, I think it is important to point out that 140 laboratories participate in checking the monthly sample under the revised Magruder plan. Already the favorable results point to even more efficient procedures in chemical control work, both by industry and the state control officials.

NPFI has in preparation a manual on standardized methods of chemical analysis for the fertilizer industry. Considerable variation in interpretation of the official methods among fertilizer laboratories prompted the decision to compile the standard methods in manual form.

In the fertilizer industry, we recognize that chemists in chemical control laboratories have a tough job. They must concern themselves with bulky, fairly crude materials prepared in large volume. These materials vary in particle size, density, shape and composition. To draw a representative sample of such materials from huge piles representing many tons of numerous batches, each of which may vary from the other, is no simple, easy matter. Often I have wondered how chemical control technicians have done so well under such demanding circumstances. On the other hand, we all recognize that, in years past, the job of chemical control was easy because of the very nature of the early fertilizer mixtures. Certainly, today, fertilizer formulation and fertilizer materials are more complex and, therefore, create a more complex problem in chemical analysis.

Further, as high analysis fertilizers go still higher, we add to this complexity. This problem can be pictured by considering the general types of fertilizers now being manufactured in nearly all regions of the country. We have the conventional or "powdered" fertilizer; granulated fertilizers in which the granules are uniform in shape; others where the granules are non-uniform in shape. There is the semi-granular type in which the particles vary in size, ranging from 100 mesh to 4 mesh, and these solid fertilizers are shipped in bags and in bulk.

The art of sampling all of these fertilizers has had to be tremendously improved over the simple procedure it was years ago. And, we must be quick and efficient about taking samples. Spreading hundreds of tons daily, moving quickly from bulk transports to an airplane at the end of the landing strip doesn't allow for delay or retakes. Higher costs of making a crop versus declining prices for farm crops, especially from grain, are forcing farmers to operate larger acreages more efficiently to achieve lower unit costs and, consequently, to preserve their margins as far as possible. These market factors, often complicated by the weather, as has happened this spring, are pushing the speed-up in farming. This, in turn, puts on more pressure for comprehensive and accurate sampling and analysis. The control service—for it is a service to farmers and to industry alike—must keep up with the season; that is when the merchandise moves. Speed with accuracy is the order of the day.

To consider another phase, we can no longer assume that chemical procedure involves chemistry alone. The physical properties of fertilizers are also involved. *In devising fertilizer control procedures, the laws of physics appear to have been largely overlooked.* The

(*Continued on Page* 87)

An Exclusive Report

Sales Personnel Practices Indicated In Nationwide Survey

One hundred and thirty-seven companies that deal in agricultural chemicals responded to an exclusive, nationwide survey conducted by "Agricultural Chemicals." The survey, the results of which are disclosed here for the first time, deals with the practices among companies in regard to compensation and responsibilities of sales personnel. Among the findings: a definite majority of firms in the industry prefer to pay a straight salary to salesmen rather than pay commissions alone; only 37% of companies assign quotas to salesmen; and 92% pay all travel expenses.

IN an attempt to determine the prevalent practices among firms dealing in agricultural chemicals, with regard to compensation and responsibilities of sales personnel, *Agricultural Chemicals* last spring conducted a nation-wide survey, the results of which are disclosed here for the first time.

One hundred and thirty-seven companies responded to the spot-survey. Forty-seven per cent of these firms deal in both pesticides and fertilizers and the remaining 53 per cent are evenly divided between the exclusive manufacture of either fertilizers or pesticides. These figures, when broken down by various sections of the United States, hold true in all areas except the West and Southwest where they contrast sharply. In the western states, only 31 per cent of the companies handle fertilizers or pesticides exclusively; in the Southeast that figure jumps to 82 per cent. For the purposes of this survey, the United States was broken down into the following five areas: Southeast, North central, South central, Northeast, and West.

The average number of sales men employed by each company in the agricultural chemicals industry is 41. This figure, however, is influenced strongly by the average of 114 salesmen per company in the Northeast, where 58 per cent of the companies do more than $50,000,000 worth of business yearly. Only the North central states come close to the nation-wide average, in the number of salesmen category, with 59. The South central average is 17 and in the West and Southeast it is 15. This, of course, is directly in line with the number of large companies in each area.

For companies in the $1,000,000 to $50,000,000 bracket, (47 per cent of those companies responding to the survey), the average number of salesmen per company is 25. This is further broken down, by area, as follows. West 21, Southeast 15, North central 36, South central 7, and Northeast 83. It must also be taken into account, when considering these figures, that many firms with headquarters in the Northeast maintain sales offices throughout the country. This also is true, to a lesser extent, of companies in the Western and North central states. About the only conclusion that can be drawn from these figures, therefore, is that there is no hard and fast rule that can be applied when determining the number of salesmen a company employs.

Compensation Agreement

When it comes to compensation for salesmen, however, a definite majority (56 per cent) of the firms in the industry prefer a straight salary arrangement compared with those which pay commissions alone (17 per cent). The remaining 27 per cent prefer a combination of salary and commissions. These figures are fairly consistent for all sections of the country, as indicated in Table 1.

Fewer than one-half of the companies surveyed, 37.2 per cent, assign quotas to their salesmen. In the South central area, however, 63.6 per cent assign quotas, a sharp departure from the other four areas, none of which exceeds 43 per cent. The South central area ranks high above the general average in the matter of incentive plans for salesmen, also, with 40 per cent of the companies reporting that they do offer incentives. The national average is only 25.6 per

cent. The most prominent incentive plan is the sales contest, for which such prizes as merchandise and expense-paid trips are awarded. Following the sales contest in popularity is the bonus arrangement for those salesmen who exceed their quotas. The method of assigning quotas to salesmen seems to be evenly divided between the size of his territory and his past performance. See Table 2.

Table 1. Methods of Compensation of Salesmen

Region	Salary	Commission	Both
Northeast	76.9%	7.6%	15.4%
North central	47.6	19	33.3
South central	54.5	9.2	35.4
West	45	20	35
Southeast	63.6	13.6	22.7
National Averages	56.3%	17.2%	28.7%

All Expenses Paid

Virtual agreement was reached in all five areas of the country on the question of how travel costs are handled. An average of 92.8 per cent of agricultural chemicals companies report that they pay all expenses for travelling salesmen. The remainder provide a definite travel allowance. Four of the five areas into which the country was divided for the purposes of this survey came within three percentage points of the national average, and one area, the Northeast, hit it exactly. Only the South central area was below the norm. There only 80 per cent of the companies responding to the survey indicated that they pay all travel expenses for their salesmen. It is interesting to note that only 53.4 per cent of the companies which pay expenses require receipts of their salesmen. Most of these, furthermore, do not expect receipts for minor expenses just the major ones, such as for hotel rooms.

Sixty-seven per cent of all companies provide company-owned automobiles to their salesmen. Ten per cent provide leased automobiles. Expenses are paid to salesmen who operate their own cars by 56 per cent of the companies. That the total of these figures is more than 100 per cent can be explained by the fact that many companies which provide company-owned cars also allow their salesmen to operate their private automobiles, if they so choose. The practice of leasing automobiles seems, for the most part, to be limited to the larger companies.

The average payment per mile made to salesmen who drive their

The five sections into which the Continental United States was divided for the purposes of the **Agricultural Chemicals** survey are shown below. Figures in parenthesis indicate the percentage of agricultural chemicals concerns doing business in the United States that operate in each area.

own automobiles is slightly over 7 cents. The highest paying area is the Northeast, where the average rate is 8.4 cents per mile, and the lowest is the North central area, where the average is 5 cents.

Little Price Flexibility

Salesmen are not allowed any flexibility in quoting prices to customers by 66 per cent of the firms queried. Two areas, however, the South central (50 per cent) and the West (53 per cent), say that their salesmen are allowed a certain amount of flexibility. Only 14 per cent of the firms in the Northeast, 25 per cent in the Southeast, and 30 per cent in the North Central areas allow salesmen to offer special prices. See Table 3.

A vast majority of companies, however, allow their salesmen to guarantee delivery dates to customers. The nation-wide average is 72 per cent. It is the larger companies, incidentally, that seem more reluctant to allow their salesmen this privilege. However, in the Southeast, even many of the smaller companies reported that their salesmen could not guarantee delivery dates. The average for the Southeast as a whole, by the way, differed most from the nation-wide average, with only 61.7 per cent in favor of allowing salesmen to guarantee delivery dates.

Overdue Accounts

At least some part of the responsibility for collecting overdue accounts falls upon the salesmen of 72 per cent of the concerns surveyed. This is further broken down in Table 4 to show the degree of responsibility placed on salesmen in the various areas.

The practice of allowing salesmen to extend payment terms to customers is followed by only 20 per cent of the companies in this field. This nation-wide percentage holds true for all sections of the country.

In cases where a salesman obtains, from the main office of a company, an order that is delivered in another territory, 54 per cent of the firms surveyed pay the commission for the sale to the salesman in whose territory the delivery is made. Another 36 per cent credit the sale to the original salesman, the remaining 8 per cent regard sales in this category as office accounts, and, therefore, no commissions are paid.

Table 2. Companies Assigning Quotas and Offering Incentives.

Region	Percent Assigning Quotas	Percent Offering Incentives
Northeast	30.7%	35.7%
North central	42.8	21.1
South central	63.6	40
West	25	15.7
Southeast	30	25
National Averages	37.2%	25.6%

Table 3. Freedom of Salesmen to Adjust Prices and Guarantee Deliveries.

Region	Percent Allowed Price Flexibility	Percent Allowed to Guarantee Delivery
Northeast	14.3%	69.2%
North central	30	80
South central	50	70
West	52.6	78.9
Southeast	25	61.7
National Averages	33.7%	72.3%

Table 4. Responsibility of Salesmen for Collecting Accounts.

Region	Degree of Responsibility			
	Complete	Main	Some	None
Northeast	34.8%	15.3%	15.3%	27.6%
North central	6.6	20	46.6	26.6
South central	11.1	22.2	33.3	33.3
West	11.8	17.6	35.3	35.3
Southeast	21.1	42.1	21.1	15.7
National Averages	17.8%	24.6%	30.1%	27.6%

Salesmen are not allowed any flexibility in quoting prices to customers by 66 per cent of the firms queried. A vast majority of companies, however, allow their salesmen to guarantee delivery dates.

Returned Orders

Another concern of sales personnel, with regard to commissions, is the problem of orders that are returned or cancelled by the customer for one reason or another. A clear-cut majority of agricultural chemicals companies, however, report that no commissions are paid in these instances and, where commissions already have been paid, they are deducted from the salesman's future payments. Only 13 per cent said that subsequent action of the customer does not affect the salesman's commission.★★

Southwest Potash Develops New Process For Potassium Nitrate

Potassium nitrate, containing the exceptionally high nutrient value of 60%, is expected to find wide use in the formulation of fertilizers for tobacco, citrus, truck, and other farm crops. Such crops respond most favorably to a potash fertilizer which is free of chlorine and sulfur, and to nitrogen in the nitrate form.

AMERICAN Metal Climax, Inc. anonunced last month plans to construct a new $7 million plant in Vicksburg, Mississippi to produce nitrate of potash and chlorine (a by product). The new plant will make nitrate of potash available for the first time at prices in the range of presently used fertilizer chemicals. Employing a new process, developed by W. Aubrey Smith (Southwest Potash vice-president in charge of research) the plant will be operated by Southwest Potash Corporation, a division of American Metal Climax.

Engineering and construction contracts were signed July 8th in Vicksburg. Thomas W. Childs, president of Southwest Potash Corp., and John C. Denton, president of Spencer Chemical Company participated in ceremonies in which Southwest Potash made the announcement and signed a contract to purchase nitric acid from the Spencer Chemical Vicksburg plant. The only important raw material to come from outside Vicksburg, said Mr. Childs, will be the muriate of potash from the Southwest Potash mine in New Mexico.

According to Mr. Childs, the new process has been under development for five years and has been pilot-plant tested in association with Jacobs Engineering Co. and the Colorado School of Mines Research Foundation at Golden, Colorado.

Mr. Childs said that engineering and construction of the Vicksburg facility will begin immediately, and that operations are scheduled to begin in October 1961. The plant will be located adjacent to the local operations of Spencer Chemical Company and the main line of Illinois Central Railroad.

Nitrate of potash is one of the best fertilizer materials for many crops, with important potentialities in high analysis mixed fertilizers. The product has not heretofore been used extensively because of its high price. It contains two of the three primary elements essential for plant growth—potash and nitrogen. Its combined potash-nitrogen plant nutrient values of 60 per cent make this compound one of the most highly concentrated plant foods available. It does not contain any chlorine or sulphur.

Nitrate of potash is expected to find wide use in the formulation of fertilizers for tobacco, citrus, truck and other farm crops which require potash free of chlorine and sulphur, and nitrogen in the nitrate form. Nitrate of potash from the new plant is expected to extend industrial uses of the material far beyond its present applications in heat-treat salts, black powder, pyrotechnics, and frit and ceramics.

The plant will be constructed and engineered for easy and economical expansion, and for the production of associated chemicals. "We already have plans under consideration" reported Mr. Childs, "for the production of two additional products, 100% nitric acid for fertilizer and industrial use and nitrogen tetroxide for industry. We look forward to when we will build other potassium chemicals from potassium nitrate, and perhaps chlorinated chemicals from our chlorine."

The officers of Southwest Potash Corporation are: Thomas W. Childs, president; Frederick H. Stewart, vice-president, operations; W. Aubrey Smith, vice-president, research; Thomas E. Camp, vice-president, sales; and A. Hunhold, secretary.

Located at 1270 Avenue of the Americas, New York 20, New York, Southwest Potash Corporation is a division of American Metal Climax, Inc., a highly diversified company which for 73 years has been engaged in various operations, including the mining, smelting and refining of metals, world-wide metal sales, and the petroleum and potash business.

The Vicksburg plant represents Southwest Potash Corporation's initial venture into chemical production.★★

Methods For Controlling White-Fringed Beetles

White-fringed beetles first were found in the United States in 1936 and now occur in eight southeastern states. Crop injury caused by the beetles may range from a mere trace in one part of a field to complete destruction in another part of the same or nearby field. In general, plants with tap-roots are damaged more severely than those with fibrous roots.

Since 1937, many compounds have been tested for their effectiveness in killing adults, larvae, and eggs of white-fringed beetles. Good adult mortalities were obtained with calcium arsenate and cryolite, but subsequent larval populations were not correspondingly reduced. The best method of controlling these insects is to kill the larvae with soil insecticides.

by Hiram C. Young
Entomology Research Division,
Agr. Res. Serv., U.S.D.A.

WHITE-fringed beetles (*Graphognathus* spp.) seriously damage field and garden crops and ornamental plants. They will feed on many kinds of plants, including wild aster, blackberry, and cocklebur, peanut, cotton, potato, and corn. The larvae, or grubs, do most of the damage. They live in the soil and feed on plant roots. Affected plants usually turn yellow, wilt, and die. Those that survive seldom develop normally. The adults feed on the foliage, but generally cause little damage.

The beetles were first found in the United States in a peanut field in Okaloosa County, Florida, in 1936. They now occur in seven other Southeastern States—Alabama, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee. Infestations that were found in Arkansas and New Jersey have been eradicated. The beetles are natives of Argentina, Brazil, Chile, and Uruguay. Infestations have also been reported in New South Wales, Australia, and the Union of South Africa.

White-fringed beetles do not usually cause uniform damage over large areas. Crop injury may range from a mere trace in one part of a field to complete destruction in another part of the same or a nearby field. In general, plants with taproots are damaged more severely than those with fibrous roots. On root crops, such as potatoes, carrots, and turnips, the larvae burrow directly into the roots, destroying the market value of the crop.

Emergence of adults from the soil begins in May and continues until early fall, the exact time depending on the locality. They are dark grey, about ⅞ inch long, and have a white fringe (or band) along the outer edges of the body. They feed on margins of leaves for several days, and then begin laying their eggs. The eggs are laid in masses on sticks and other debris lying on the soil; on stems of plants; or in the soil, usually near the roots of a plant. In the presence of favored food, adults live 2 to 5 months and lay eggs during much of the time. The right combination of temperature and moisture is required for the eggs to hatch. Eggs laid in the summer hatch after about 17 days, but those laid in the fall and winter require longer periods, sometimes as many as 100 days. Some eggs may remain viable throughout the winter and hatch the following spring. The larvae are yellowish-white and up to ½ inch long. They enter the soil and feed almost constantly. Larval development takes about 11 months; but under certain conditions, 2 years or more are needed. Normally these insects pass the winter as larvae in the soil, but they may overwinter as eggs. There is only one generation a year. All adults are females and are capable of laying fertile eggs.

Since 1937 many compounds have been tested for their effectiveness in killing adults, larvae, and eggs of white-fringed beetles. The better materials found in these tests have been used by individuals and in the Federal-State control program. Early tests showed that calcium arsenate and cryolite were effective killing agents for adult white-fringed beetles. Calcium ar-

senate was the first insecticide to be used extensively, but it could not be applied to legumes. Cryolite was used for the control of the adults from 1939 through 1945, as it could be applied to most crops and wastelands without plant damage. These insecticides were first applied as dusts, but summer rains and plant growth necessitated frequent applications. Cryolite acted only as a stomach poison and it was necessary to keep the foliage covered throughout the period of adult emergence (60 to 120 days). From 10 to 25 applications were required. A dilute cryolite spray with an oil adhesive was devised which reduced the volume of liquid. This concentrated spray had better adhesive qualities than the dilute spray and was more economical.

Good adult mortalities were obtained with calcium arsenate and cryolite, but subsequent larval populations were not correspondingly reduced. Because of this insect's high reproductive potential, an extremely high adult mortality must be obtained to reduce future larval populations. The chlorinated hydrocarbon insecticides were found to be very effective against white-fringed beetles. DDT, the first one available, gave high mortalities of adults. It acted as a contact insecticide as well as a stomach poison. An emulsion spray applied at 14- to 21-day intervals during the adult season at the rate of 1 pound of DDT in 6 gallons of liquid per acre gave a high mortality of adults and a drastic reduction in the subsequent larval populations. The DDT foliage treatment was more effective and economical than the cryolite treatment.

The best method of controlling these insects is to kill the larvae by applying an insecticide to the soil. A single application remains effective for several years. The insecticides, that have proved to be most effective are listed in Table 1. They may be applied in sprays, dusts, or granules, by power or hand equipment, or by airplane.

Table 1. Application of Insecticides to Control White-Fringed Beetle Larvae

Type of land	Insecticide	Broadcast		Drill rows	
		Pounds per acre	Years effective	Pounds per acre	Years effective
		Soil treatment			
Cultivated	Aldrin	2	3 or more	½ to ¾	1
	Chlordane	5	3	¾ to 1	1
	DDT	10	4	1 to 2	1
	Dieldrin	1½	4 or more	2 to 3	1
	Heptachlor	2	3 or more	¾ to 1	1
		Surface treatment			
Noncultivated	Dieldrin	3 to 5	4 or more		

The recommended dosages of these insecticides are effective against the newly hatched larvae, but kill very few of the full-grown larvae.

The larvae can be controlled in cultivated land by broadcasting one of the insecticides on the soil when preparing it for planting and immediately working it thoroughly into the upper 3 or 4 inches. The soil should be worked at least twice with a tandem tractor disk. An alternate treatment is to apply the insecticide, alone or mixed with fertilizer, in the drill row at time of planting. Row treatments give crop protection, but are not as effective in reducing overall beetle populations the first years as are broadcast treatments. Where drill row treatments are applied annually for 3 or 4 years, the reduced beetle population and residual effect of the insecticide usually prevent crop damage for several more years.

Aldrin, chlordane, DDT, dieldrin, and heptachlor, when thoroughly incorporated into the upper 3 or 4 inches of soil at rates somewhat greater than that shown in Table 1, will give complete mortality of white-fringed beetle larvae for several years. Soil treatments with these insecticides are now used as the basis for certification of plants grown in the white-fringed beetle quarantine area.

In the cooperative Federal-State program for control of white-fringed beetles, one problem has been to suppress or eliminate populations on and near dissemination points to prevent spread of the insect. These areas consist of non-cultivated land such as lawns, industrial and railroad properties, roadsides, and wastelands. In this program, repeated foliage applications were required each year. In an extensive series of tests initiated in 1950 with a number of insecticides applied on the surface of noncultivated land, dieldrin gave outstanding results. Since dieldrin surface treatments proved so effective on noncultivated land, they have largely replaced the foliage treatments. Dieldrin surface treatments are approved for use only on non-cultivated land not used for grazing animals. The dieldrin should be applied at the rate of 3 to 5 pounds per acre during the winter and early spring before vegetation becomes dense. Granular formulations have proved best for surface treatments.

The insecticides given in Table 1 should be applied only to the crops on which their use is approved.

Applications to the drill row should be made so that the insecticide is deposited slightly below the depth of the seed. The maximum dosage is required when the distance between rows is less than 3½ feet, and the minimum dosage if it is more than 6 feet.

Treatment of noncultivated land with dieldrin should be made only under the general direction of Federal or State Plant Pest Control personnel.

(Continued on Page 93)

More NPFI Meeting Pictures...

1. E. E. Crouse, CD Fertilizer Corp., Liberty, Ind.; Mr. and Mrs. H. Coleman and H. H. Tucker, Sohio Chemical Co.; E. C. Aylward, Aylco Chemical Co., Sullivan, Ill.; and J. Bibbins, Sohio.
2. G. Alber, Marion Plant Life Fertilizer Co., Marion, Ohio; and G. Urbanix, International Minerals & Chemical Corp.
3. J. C. Mooar, Marietta Concrete Co., Atlanta; K. D. Jacob, USDA; and J. E. Culpepper, Spencer Chemical Co.
4. F. Bryant, Brown & Bryant, Shafter, Calif.; Mr. & Mrs. W. J. Francis, American Potash & Chemical Corp., Los Angeles; and V. Wilson, Brown & Bryant.
5. Seated: Mrs. V. Venugopal and Mrs. H. Zaheer, of India; standing: Mrs. V. Sauchelli; Mrs. H. S. Ten Eyck, International Ore & Fertilizer Corp.; Vincent Sauchelli, NPFI; and H. Zaheer.
6. W. P. Dean, Swift & Co.; J. D. Zigler, International Minerals & Chemical Corp.; and Tom Rogers and C. Camp of Nitrogen Division, Allied Chemical Corp.

Another full page of photos and the complete story of the 1960 convention of the National Plant Food Institute may be found, beginning on page 28, in the July issue of AGRICULTURAL CHEMICALS.

PHOTOS ON FACING PAGE

1. J. F. Reed and W. Nelson, American Potash Institute; and C. T. Nixon, J. C. Anderson, and M. Rowe, Ashcraft-Wilkinson Co., Atlanta.
2. E. N. Shelton, Tennessee Corp., New York; K. Stuart, Colorado Fuel & Iron Corp.; and B. W. Bellinger, Tennessee Corp.
3. J. Sharp, Spencer Chemical Co.; R. Everett, Empire Sales Training Co.; and J. E. Tuning, Spencer Chemical Co.
4. H. Lefevre, Dominion Potash Ltd., West Mount, Canada; T. W. Childs, Southwest Potash Corp., New York; and R. Gadonneix, French Potash Import.
5. J. F. Criswell, Agricultural Ammonia Institute; D. H. Bradford, Mid-South Chemical Corp.; T. Plant, Columbia Southern Co.; and D. L. Harrison, Mid-South Chemical Corp.
6. Ralph Waltz, Wilson & Geo. Meyer & Co.; B. W. Smith, Minnesota Liquid Fertilizer Co.; and R. Bond, Stauffer Chemical Co.
7. P. H. Neal, Ketona Chemical Corp., Birmingham; C. E. Workman, U. S. Phosphoric Products, Tampa; and J. Carlile, J. C. Carlile Corp., Denver, Colo.
8. J. Lawler, Shell Chemical Corp.; and Fred Hatch, Frederick W. Hatch Associates.
9. F. J. Ronan, W. J. Haude, and L. P. Messari, all of Grace Chemical Co.
10. Tom Jones, Gilman Paper Co.; Charles Mittleman, Kraft Bag Corp.; and T. S. Whitsel, Union Special Machine Co.

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Pesticides And The Public

THE IMPORTANCE AND PROBLEMS OF CHEMICALS IN FOOD

"Are some of the chemicals that have done so much to improve our food supply likely to be harmful to people if minute quantities are present in foods they eat?" This is the question facing those who are concerned with the development and use of agricultural chemicals.

Man has the competence to use agricultural chemicals to great advantage without harm to anyone. The significant factor that must be taken into consideration when determining the safety of a given chemical is the level at which a chemical residue becomes toxic.

by W. L. Popham
Deputy Administrator,
Agricultural Research Service,
U. S. Department of Agriculture

AMERICAN consumers enjoy the highest quality food supply the world has ever known. Wholesome, nutritious foods come in wide variety and convenient form. They are available every day in the year at reasonable prices.

This remarkable accomplishment by farmers and the food industry is due in no small part to the use of agricultural chemicals. Farmers are dependent on chemicals to protect crops and livestock from insects, diseases, and weeds, and to increase the efficiency of farm operations in other ways. Food processors and distributors need chemicals to preserve and enhance the natural excellence of foods after they leave the farm. Consumers are dependent on chemicals for the quality and quantity of their food supply.

The importance of chemicals in the production of wholesome, high-quality foods was high-lighted in a recent talk by Dr. John H. Lilly, head of the Department of Entomology and Plant Pathology, University of Massachusetts. Dr. Lilly said: "Out of curiosity and hunger for some nice fresh fruit, I stopped last summer at a roadside stand which advertised the fact that no chemicals had been used to protect their crops. There wasn't a thing in sight that I would accept as a gift! The sweet corn was crawling with earthworms and corn borers, the potatoes were mutilated by various soil insects, the raspberries were fortified with living animal protein, and the carrots were just plain pathetic."

Compare these contaminated, pest-damaged foods with the high-quality fruits, vegetables, cereals, meat, and dairy products available in any good market today. A quick look at the produce in grocery carts, as customers line up at the check-out counters, is evidence enough that consumers prefer the intelligent use of chemicals to the unappetizing, insect-ridden fruits and vegetables referred to above.

But consumers demand that the use of chemicals be entirely consistent with the safety and wholesomeness of foods as they are purchased at the market and served at the family table. This is a reasonable demand, and it has long been recognized as such by both Federal and State Governments. It merits the most careful consideration now, because of the question being raised regarding the safety of certain chemicals used in the production, processing, and marketing of food products.

The question—which faces all of us who are concerned with the development and use of agricultural chemicals—is simply this: Are some of the chemicals that have done so much to improve our food supply likely to be harmful to people if minute quantities are present in foods they eat?

This is a fair question. It deserves a thoughtful answer. We will not find that answer in hasty decisions and actions. We must consider the facts more carefully, and avail ourselves of competent judgment, before a proper reply can be made.

First, let's take a look at the facts.

Agricultural chemicals in use today are all products of research—conducted by the Department of Agriculture, the State agricultural experiment stations, and the chemical and food industries. Safety of these chemicals is a prime consideration at every stage of development and use.

Soil scientists, for example, are concerned with the fate of chemicals in the soil and their effects on beneficial soil microorganisms. In crop, livestock, and entomology research, we look for chemicals that are effective for particular purposes without doing injury to plants, farm animals, wildlife, or consumers. Agricultural engineers are concerned with developing efficient and safe methods of application. In utilization and marketing research, we seek chemicals that will protect or improve food quality without adversely affecting flavor, nutritive content, or safety of the product. And, finally, nutritive scientists are concerned with chemical residues in foods as they may affect the health and nutritional welfare of consumers.

Only a few of the hundreds of compounds studied every year eventually reach the market. Many insecticides, for example, that are highly effective against crop and livestock pests are rejected in the laboratory because of the risk of harmful or illegal residues.

Chemicals that are sold interstate must meet the exacting safety standards required for registration by the Federal Government. In carrying out its obligations under the law in regard to pesticide regulation, the Department of Agriculture has registered more than 56,000 chemical formulations. Many of these registrations are for chemicals that have residue tolerances established by the Food and Drug Administration. Others are for chemicals that are not allowed to leave residues on food crops or in livestock products. Chemicals that do not meet the standards set by law, when tested under objective, scientific conditions, are not approved. Those that are approved must bear a label giving accurate directions, clearly stated, for safe and effective use.

Obtaining a registration for a new chemical formulation is neither simple nor easy.

When a chemical company discovers or synthesizes a new chemical with potential pesticidal qualities, several years of careful testing may be required to determine its usefullness. This is the responsibility of the manufacturer, but the work is often done in cooperation with State and Federal scientists.

Once usefulness has been established and a treatment schedule developed for various crops or animals, the manufacturer must determine what, if any, residue will remain if directions for use are followed.

If a residue in any amount remains on a crop—food or feed—it then becomes the responsibility of the Food and Drug Administration to determine the level at which residues are safe. Tolerances established for a given pesticide vary from zero to several parts per million, depending on the toxicity of the chemical and the uses for which it is intended.

Once a tolerance has been established and the manufacturer has submitted convincing evidence that the material, if used as directed on the approved label, will meet the tolerance and at the same time occupy a useful place in agriculture, registration is granted. Few if any items offered on the market today have been more thoroughly studied from the standpoint of safety than our pesticide chemicals.

Agricultural chemicals must be used in accordance with instructions. When so used there is no evidence that such chemicals have resulted in residues in foods that are harmful to consumers. Food chemicals may be compared with drugs, firearms, explosives, and automobiles. If properly used, they are of great value; if improperly used, they may do harm.

The same is true of chemicals that occur naturally in foods. Copper, manganese, zinc, cobalt, chromium, molybdenum, fluorine, and selenium are among chemicals known to be essential in minute quantities for good nutritional health. Yet every one of these chemical elements is known to be harmful if fed in large amounts. Selenium, for example, when present in normal amounts in the diet—about 0.1 per million—has no measurable effect on animal health. Animals on diets with subnormal amounts of selenium—for example, 0.05 ppm—are not thrifty and show abnormalities of the muscular and internal organs. It is only when excessive amounts—say 5 ppm and above—occur in the diet that selenium produces toxic symptoms. Here, then is a chemical, a carcinogen, a toxicant, which in proper amount is essential to animal health, but in excessive amounts is a lethal poison.

All chemicals have some toxicity, therefore, without speaking of dosage. Neither can we define carcinogenicity—that is, cancer-pro-

(*Continued on Page* 92)

Food chemicals may be compared with drugs, firearms, explosives, and cars.

If properly used, they are of great value; if improperly used, they may do harm.

SOUND PROMOTION MEANS SOLID PROFITS

One of the surest ways to ring your cash register is by spreading the word on new ag chemical developments. Leading farm magazines are the primary channels for this news to your grower-customers. That's why we use these publications to tell farmers about new Niagara products and services—in advertising campaigns and in articles based on information we make available to editors and writers. For no matter how good a product is, farmers must know about it before they buy it.

Backing up these programs in magazines are direct mail to growers . . . technical bulletins to county agents and other ag leaders . . . displays at important grower meetings . . . outdoor advertising. And we make available to you such aids as leaflets on new products like TEDION®, ETHION, THIODAN® . . . spray schedules and insect guides.

Such sound promotion has an impact on farmers. They come into your store looking for Niagara products . . . confident that they'll get good results. You'll find it has an equal impact on your cash register. For information write Dept. A:

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Niagara Chemical Division • Middleport, N. Y.

Production Roundtable

Joe C. Sharp

Mr. Sharp is with Spencer Chemical Co., Kansas City, Mo.

Moisture and Ammonium Nitrate Content Of Granular Mixed Fertilizer *vs Mechanical Condition*

There is a definite relationship between ammonium nitrate content, moisture content, and mechanical condition. A conditioning agent is recommended on grades containing more than 350 pounds of ammonium nitrate.

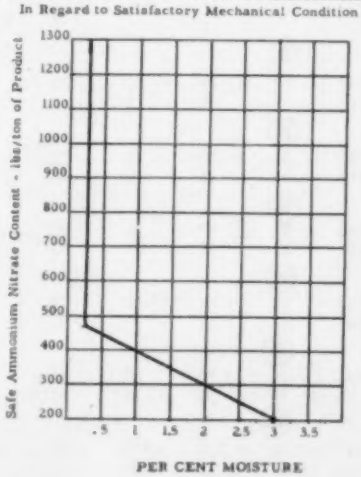
Time can be saved in formulating, and the source of error reduced by the use of tables and charts discussed in this article. The long explanation of the use of these aids makes the cure appear to be worse than the disease, but once the system has been used for a time, reliable short cuts become obvious. The tables can become a permanent formulation aid.

IT has been well demonstrated and generally agreed upon throughout the fertilizer industry that the mechanical condition of granular mixed fertilizer is closely tied to its content of moisture and ammonium nitrate, moisture and urea, or a combination of these two nitrogen-bearing salts. This article attempts to put quantitative values on this relationship for moisture and ammonium nitrate, and to demonstrate how tables can be an aid to fast, accurate formulation.

Actual data is lacking to support this relationship for all grades of granular fertilizer, but there is sufficient data and experience to make it safe to use the accompanying graphs as formulation guides.

In addition to holding to the moisture-ammonium nitrate relationship from the chart in Figure 1, it is recommended that a conditioning agent be used on grades that contain more than 350 pounds of ammonium nitrate per ton of product. Kaolin clay or diatomaceous earth have proven to be effective conditioning agents. The graph in Figure 1 does not go below a 200 pound per ton ammonium nitrate content. Grades containing less than 200 pounds of ammonium nitrate, properly granulated and dried to less than 3 per cent moisture, should not cause mechanical condition problems. This statement will probably not hold true on extremely high analysis grades. It is also important to cool the fertilizer to within 10 degrees to 15 degrees Fahrenheit of ambient temperature before bagging.

FIGURE NO. 1
MOISTURE AMMONIUM NITRATE RELATIONSHIP
In Regard to Satisfactory Mechanical Condition



Tables For Formulation

MUCH time can be saved in making and changing formulas by use of pre-calculated tables. An added advantage is that the possibility of error can be greatly reduced, because the proven figures in the tables serve as reference points, and changes in pounds of any material will be small. A big change in the weight of a material is a red flag to serve as a warning that something is wrong and calculations need to be checked.

Table #1 is a table of formulas for 12-12-12 formulations. Plants electing to use this system will need to prepare a table of formulas for each regular grade they manufacture. This is not as big a job as it appears. For example, in Table 1 only formulas 1 and 9 were actually calculated. The others were arrived at by simple arithmetic. Formula 5 was made by adding the pounds of each ingredient in formulas 1 and 9 and dividing by two. Formula 3 was made by adding formulas 1 and 5 and dividing by two; formula 7 was made by adding for-

mulas 5 and 9 and dividing by two; etc.

To keep the process simple, ammoniating solution is not shown in the table of formulas. Instead, basic materials that make up ammoniating solutions are shown. For the same reason, sulfuric acid is not shown in the table of formulas. Ammonium sulfate, the product that is formed when sulfuric acid reacts with ammonia is shown.

It will be noted that Formula 1 contains no ammonium nitrate and formula 9 contains no ammonium sulfate. Because of the difference in nitrogen content of ammonium nitrate and ammonium sulfate, formula 1 has to obtain most of the P_2O_5 from triple superphosphate; whereas, formula 9 gets most of the P_2O_5 from normal superphosphate.

As a permanent record and formulation aid, it is suggested that a table of formulas for a grade of fertilizer be put on standard file size (8½ x 11) heavy graph paper on the plain side of the paper. On the ruled side of the sheet, make a graph similar to the one in Figure 2, showing the location on the curve of the ammonium nitrate content when all of the nitrogen is derived from several ammoniating solutions. It would be well to protect this sheet with a transparent plastic cover. Tables 2, 3 and 4 should also be prepared on 8½" x 11" paper and protected with plastic covers. Additional tables may also be needed, depending on the raw materials being used at the plant. For example, a plant substituting phosphoric acid for triple superphosphate would need both formula tables and conversion tables for that combination.

How To Use The Tables

BY examining the chart in Figure 2, it can be seen that when all the nitrogen is derived from 414 (19-74-0), 430 pounds of ammonium nitrate is put in a ton of product; 448 (25-69-0) adds 370 pounds of ammonium nitrate, and 471 (30-64-0) furnishes 326 pounds of ammonium nitrate.

The production manager, knowing his plant capacity, demands on production, and other factors to be considered, will decide on what solution is best suited for his purposes. In the first example on how to use the tables, it will be assumed that all the nitrogen will be derived from 414 (19-74-0).

The graph in Figure 2 shows that if the product is to contain 430 pounds of ammonium nitrate per ton, the moisture content

TABLE No. 1

12-12-12 Formulas

		1	2	3	4	5	6	7	8	9
Ammonia	82.2% N	44	46	48	50	52	53	55	56	58
Ammonium Nitrate	35.0% N	-	69	137	206	275	344	412	481	550
Ammonium Sulfate	20.7% N	983	860	737	614	491	368	245	123	-
Triple Superphosphate	48.5% P_2O_5	434	392	350	308	266	224	182	140	97
Normal Superphosphate	21.6% P_2O_5	139	233	328	422	517	611	706	800	895
Muriate of Potash	60.0% K_2O	400	400	400	400	400	400	400	400	400
		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000

The ammonia shown in the formulas is based on a 3.8% ammoniation rate for triple superphosphate and 5.0% for normal superphosphate.
More ammonia than is shown, as such, is added, but is in combined form as ammonium sulfate.

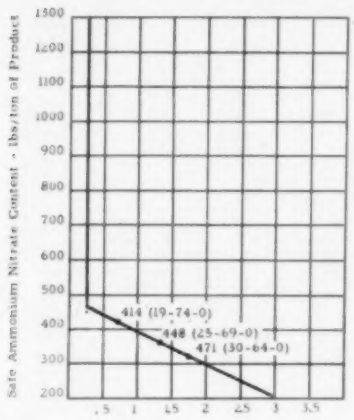
TABLE No. 2

Table to change pounds of ammonium nitrate to pounds of ammonium sulfate to the nearest whole number and hold the nitrogen content constant. The resulting change in formula weight is also indicated. Based on 35.0% nitrogen — ammonium nitrate, and 20.7% nitrogen — ammonium sulfate, on a bone dry basis.

The **bold type** numerals in the top row represent pounds of ammonium nitrate from 0 to 9. The **bold type** numeral ⑩ in the left column represents 10 pounds of ammonium nitrate; **bold type** numeral ⑳ represents 20 pounds of ammonium nitrate, etc. Thus, from 0 to 9 pounds of ammonium nitrate are represented by the **bold type** numbers in the top row, plus the **bold type** numbers in the left column. Rows (a) represent the pounds of ammonium sulfate required to supply the same nitrogen as the corresponding pounds of ammonium nitrate. For example, beneath **bold type** numeral 8 in the top row, the figure 13 in row (a) represents the pounds of ammonium sulfate required to supply the same nitrogen as 8 pounds of ammonium nitrate. Likewise, 30 pounds of ammonium sulfate as shown in row (a) beneath the **bold type** numbers 10 and 8 supplies the same nitrogen as 18 pounds of ammonium nitrate. The difference in weight between 13 and 8 is 5 which is shown in row (b), beneath the figure 13; the difference in weight between 30 and 18 is 12 which is shown in row (b) beneath the figure 30 in row (a).

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
(a)		2	3	5	7	8	10	12	13	15
(b)		1	1	2	3	3	4	5	5	6
	⑱									
(a)	17	19	20	22	24	25	27	29	30	32
(b)	7	8	8	9	10	10	11	12	12	13
	㉘									
(a)	34	36	37	39	41	42	44	46	47	49
(b)	14	15	15	16	17	17	18	19	19	20
	㊳									
(a)	51	53	54	56	58	59	61	63	64	66
(b)	21	22	22	23	24	24	25	26	26	27
	㊽									
(a)	68	70	71	73	75	76	78	80	81	83
(b)	28	29	29	30	31	31	32	33	33	34
	㊿									
(a)	85	86	88	90	91	93	95	96	98	100
(b)	35	35	36	37	37	38	39	39	40	41
	㊿									
(a)	101	103	105	106	108	110	111	113	115	116
(b)	41	42	43	43	44	45	45	46	47	47

FIGURE NO. 2
MOISTURE AMMONIUM NITRATE RELATIONSHIP
In Regard to Satisfactory Mechanical Condition



should be 0.7 per cent or below. In the table of formulas (Table 1), it is noted that formula 7 contains 412 pounds of ammonium nitrate. That is the closest figure to 430 pounds of ammonium nitrate in any of the formulas. The difference between 430 and 412 is 18. This means that 18 pounds of ammonium nitrate must be added to formula 7. Looking at Table 2, it is seen that in order to hold the nitrogen constant when 18 pounds of ammonium nitrate are added, 30 pounds of ammonium sulfate must be subtracted, and the change in formula weight is 12 pounds; thus, the following revision of formula 7:

	7	Revision No. 1
Ammonia	55	55
Ammonium Nitrate	412	430
Ammonium Sulfate	245	215
Triple Superphosphate	182	182
Normal Superphosphate	706	706
Muriate of Potash	400	400
	2,000	1,988

Since the product is to contain 0.7 per cent moisture or 14 pounds per ton, and since the formulas in the table are on a bone dry basis, the bone dry materials will total 1,986 pounds per ton of product. Revision No. 1 totals 1,988 pounds, so a further correction of 2 pounds must be made for 100 per cent accuracy. The formula, as is, is accurate enough for all practical purposes, but for the sake of illustration the correction will be made. Table 3 shows that when the formula weight is decreased by 2 pounds, 1 pound of triple superphosphate must be added and 3 pounds of normal superphosphate must be subtracted; hence, Revision No. 2, the final bone dry formula:

	Revision No. 1	Revision No. 2
Ammonia	55	55
Ammonium Nitrate	430	430
Ammonium Sulfate	215	215
Triple Superphosphate	182	183
Normal Superphosphate	706	703
Muriate of Potash	400	400
	1,988	1,986

To find the actual raw materials to be metered into process:

$$414 \text{ (19-74-0)} \frac{\text{430 pounds Ammonium Nitrate/Ton}}{\text{.74 decimal fraction of Ammonium Nitrate in 414}} = 580$$

580 x .19 (Decimal fraction of NH_3 in 414) = 110 NH_3 Introduced
110-55 (Pounds NH_3 for combined phosphates) = 55 pounds NH_3 to be neutralized with sulfuric acid.

TABLE No. 3

Table to change the weights of triple and normal superphosphate to compensate for changing formula weights to hold the P_2O_5 content constant. Based on 48.5% P_2O_5 — triple superphosphate and 21.6% P_2O_5 — normal superphosphate — both on bone dry basis.

The **bold type** numerals in the top row represent pound changes in formula weight from 0 to 9. The **bold type** numeral (10) in the left column represents 10 pounds change in formula weight; **bold type** numeral (20) represents 20 pounds change in formula weight, etc. Thus, from 0 to 69 pounds change in formula weight are represented by the **bold type** numerals in the top row plus the **bold type** numerals in the left column. Rows (a) represent the changes in weight of triple superphosphate, and rows (b) represent the changes in weight of normal superphosphate to hold the P_2O_5 content constant for the corresponding change in formula weight. For example, beneath the **bold type** numeral 8 in the top row, the triple superphosphate must be changed 7 pounds as shown in row (a). The figure 15 in row (b) under the figure 7 in row (a) represents the change in weight of normal superphosphate. If the 8 pounds have been subtracted from the formula weight, the triple superphosphate is decreased and the normal superphosphate is increased.

	0	1	2	3	4	5	6	7	8	9
(a)		0	1	2	3	4	5	6	7	7
(b)		1	3	5	7	9	11	13	15	15
	(10)									
(a)	8	8	9	10	11	12	13	14	15	16
(b)	18	19	21	23	25	27	29	31	33	34
	(20)									
(a)	16	16	17	18	19	20	21	22	23	23
(b)	36	37	39	41	43	45	47	49	51	52
	(30)									
(a)	24	24	25	26	27	28	29	30	31	31
(b)	54	55	57	59	61	63	65	67	69	70
	(40)									
(a)	32	32	33	34	35	36	37	38	39	39
(b)	72	73	75	77	79	81	83	85	87	88
	(50)									
(a)	40	40	41	42	43	44	45	46	47	47
(b)	90	91	93	95	97	99	101	103	105	106
	(60)									
(a)	48	48	49	50	51	52	53	54	55	55
(b)	108	109	111	113	115	117	119	121	123	124

Table 4 shows 170.5 pounds 66 degrees Be' sulfuric acid needed. Assuming 5 per cent moisture content on triple superphosphate, then pounds of triple superphosphate to be added to process are:

$$.95 \div 183 = 193$$

Assuming 7 per cent moisture content on normal superphosphate: 703 ÷ .93 = 757 pounds normal superphosphate to be added to process. Revision No. 2 can be changed as follows:

Revision No. 2

Ammonia	55
Ammonium nitrate	430
Ammonium Sulfate	215
Triple Superphosphate	183
Normal Superphosphate	703
Muriate of Potash	400
	1,986

Actual Raw Materials

414 (19-74-0)	580
66° Be' Sulfuric Acid	170
	193
	757
	400
	2,100

Now suppose the triple superphosphate should not analyze 48.5 per cent P_2O_5 on the bone dry basis, but only 47.5 per cent, and that the normal superphosphate would analyze only 21.0 per cent P_2O_5. To make the necessary correction in the final bone dry formula, multiply the pounds of each phosphate by their decimal fraction analyses:

Triple Superphosphate
183 x .475 = 87.0 pounds P_2O_5
Normal Superphosphate
703 x .21 = 147.2 pounds P_2O_5
Total 234.2

Since 240.0 pounds of P_2O_5 are required:

$$240.0 - 234.2 = 5.8 \text{ pounds short}$$

$$\frac{5.8}{(.475 - .21)} = 22.0 \text{ pounds}$$

This means that 22 pounds of triple superphosphate must be added and 22 pounds of normal superphosphate substracted; thus, Revision No. 3 would be:

TABLE No. 4

Table to show pounds of 66° Be' sulfuric acid and pounds 100% sulfuric acid required to neutralize from 1 to 109 pounds of ammonia. The resulting pounds of bone dry ammonium sulfate produced are also shown.

The **bold type** numerals in the top row represent pounds of NH_3 from 0 to 9. The **bold type** numeral (10) in the left column represents 10 pounds of NH_3; **bold type** numeral (20) represents 20 pounds of NH_3, etc. Rows (a) give pounds of 100% H_2SO_4 required to neutralize corresponding pounds of NH_3; rows (b) give pounds of bone dry ammonium sulfate formed; and rows (c) give pounds of 66° Be' H_2SO_4 required.

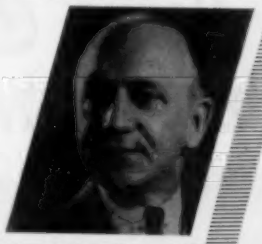
	0	1	2	3	4	5	6	7	8	9
(a)		2.88	5.76	8.64	11.52	14.40	17.28	20.16	23.04	25.92
(b)		3.88	7.76	11.64	15.52	19.40	23.28	27.16	31.04	34.92
(c)		3.10	6.20	9.30	12.40	15.50	18.60	21.70	24.80	27.90
	(10)									
(a)	28.80	31.68	34.56	37.44	40.32	43.20	46.08	48.96	51.84	54.72
(b)	38.80	42.68	46.56	50.44	54.32	58.20	62.08	65.96	69.84	73.72
(c)	31.00	34.10	37.20	40.30	43.40	46.50	49.60	52.70	55.80	58.90
	(20)									
(a)	57.60	60.48	63.36	66.24	69.12	72.00	74.88	77.76	80.64	83.52
(b)	77.60	81.48	85.36	89.24	93.12	97.00	100.88	104.76	108.64	112.52
(c)	62.00	65.10	68.20	71.30	74.40	77.50	80.60	83.70	86.80	89.90
	(30)									
(a)	86.40	89.28	92.16	95.04	97.92	100.80	103.68	106.56	109.44	112.32
(b)	116.40	120.28	124.16	128.04	131.92	135.80	139.68	143.56	147.44	151.32
(c)	93.00	96.10	99.20	102.30	105.40	108.50	111.60	114.70	117.80	120.90
	(40)									
(a)	115.20	118.08	120.96	123.84	126.72	129.60	132.48	135.36	138.24	141.12
(b)	155.20	159.08	162.96	166.84	170.72	174.60	178.48	182.36	186.24	190.12
(c)	124.00	127.10	130.20	133.30	136.40	139.50	142.60	145.70	148.80	151.90
	(50)									
(a)	144.00	146.88	149.76	152.64	155.52	158.40	161.28	164.16	167.04	169.92
(b)	194.00	197.88	201.76	205.64	209.52	213.40	217.28	221.16	225.04	228.92
(c)	155.00	158.10	161.20	164.30	167.40	170.50	173.60	176.70	179.80	182.90
	(60)									
(a)	172.80	175.68	178.56	181.44	184.32	187.20	190.08	192.96	195.84	198.72
(b)	232.80	236.68	240.56	244.44	248.32	252.20	256.08	259.96	263.84	267.72
(c)	186.00	189.10	192.20	195.30	198.40	201.50	204.60	207.70	210.80	213.90
	(70)									
(a)	201.60	204.48	207.36	210.24	213.12	216.00	218.88	221.76	224.64	227.52
(b)	271.60	275.48	279.36	283.24	287.12	291.00	294.88	298.76	302.64	306.52
(c)	217.00	220.10	223.20	226.30	229.40	232.50	235.60	238.70	241.80	244.90
	(80)									
(a)	230.40	233.28	236.16	239.04	241.92	244.80	247.68	250.56	253.44	256.32
(b)	310.40	314.28	318.16	322.04	325.92	329.80	333.68	337.56	341.44	345.32
(c)	248.00	251.10	254.20	257.30	260.40	263.50	266.60	269.70	272.80	275.90
	(90)									
(a)	259.20	262.08	264.96	267.84	270.72	273.60	276.48	279.36	282.24	285.12
(b)	349.20	353.08	356.96	360.84	364.72	368.60	372.48	376.36	380.24	384.12
(c)	279.00	282.10	285.20	288.30	291.40	294.50	297.60	300.70	303.80	306.90
	(100)									
(a)	288.00	290.88	293.76	296.64	299.52	302.40	305.28	308.16	311.04	313.92
(b)	388.00	391.88	395.76	399.64	403.52	407.40	411.28	415.16	419.04	422.92
(c)	310.00	313.10	316.20	319.30	322.40	325.50	328.60	331.70	334.80	337.90

	Revision No. 2	Revision No. 3	Revision No. 4
Ammonia	55	55—1	54
Ammonium Nitrate	430	430	430
Ammonium Sulfate	215	215+4	219
Triple Superphosphate	183	205+2	207
Normal Superphosphate	703	681—5	676
Muriate of Potash	400	400	400
	1,986	1,986	1,986

Since the P_2O_5 from triple superphosphate has increased, the capacity of the combined phosphates to react with ammonia has decreased slightly. In this instance, it is close enough for practical purposes, but for the sake of illustra-

(*Continued on Page* 89)

Fertilizer Views and News



Dr. Vincent Sauchelli

Dr. Sauchelli is Chemical Technologist for National Plant Food Institute.

Fertilizers, Insecticides, and Soil Fertility

I remember the time when the stable would yield
Whatsoever was needed to fatten a field;
But chemistry now into tillage we lugs,
And we drenches the earth with a parcel of drugs;
All we poisons, I hope, is the slugs.

—Punch, 1846

TIME was when the farmer contented himself with applying animal manures alone to fertilize the soil. To many persons, those were "the good old days." In Great Britain, they still have "the muck and mystery boys," that group who condemn chemical farming, claiming that all chemical fertilizers are bad and that only natural manure from animals, or night soil and materials of that kind are useful fertilizing materials. In our own country we also have the same type of persons who advocate "organic farming," that is, the exclusive use of animal manures, composts and such natural materials as limestone and phosphate rock. Their opponents designate this group by a less gracious appellation than "muck and mystery boys."

It may be argued with much justice that those who have too exclusively a purely chemical outlook on soil fertility are shortsighted. Their attitude is too extreme and is to be condemned just as strongly as that of the other extremists, the advocates of the manure pile and nothing but "natural organics." Soil fertility means more than keeping the soil reaction right, providing the nutrients, nitrogen, phosphate and potash in proper amounts in the available form and, as needed, other beneficial elements such as sodium and the trace elements.

Soil fertility should be considered from at least three viewpoints: (1) As a soil bank of the essential plant nutrients, as the chemical group maintains—these elements must be present in abundance and in a reasonable proportion or ,"balance;" (2) As a reservoir of water—water can be a limiting factor and the function of the soil as a reservoir is a most important phase of soil fertility; (3) As a supplier of proper amounts of essential gases, such as carbon dioxide and oxygen—the atmosphere of the soil is an important factor in maintaining vigorous growth, a build-up of carbon dioxide in the soil air beyond the vital point can impede root absorption of water and nutrients. This relationship is well recognized in the case of man and animals, but not generally in the case of plant life. An increase of the CO_2 content of the soil air beyond the normal can damage plant growth.

Fertilizer-Insecticide Mixtures

With the above preliminary comments on soil fertility as a background let us now consider the use of mixtures of chemical fertilizers and insecticides. This development is relatively recent and is regarded by many as an advance in modern agriculture. A substantial acreage of cropland in the United States is annually being treated with such mixtures. What effect does this practice have on soil fertility.

Most of the insecticides which are being used belong to the group of chemicals known as chlorinated hydrocarbons, examples of which are DDT, aldrin, dieldrin, heptachlor, chlordane and BHC. The principal advantage given by practitioners is saving in time and expense, deriving from the one operation. Admitting this advantage, is there the disadvantage of a possible accumulation of harmful residues in the soil? To answer this question scientists in the U. S. Department of Agriculture have been studying the problem since 1949 in cooperation with several state agricultural experiment stations (U. S. D. A. Tech. Bulletin No. 1121). Their findings indicate that crop responses to treatments of the soil with DDT, BHC and chlordane differed markedly among soil types. Soils having a high content of organic matter seem to show less residual toxicity. DDT, BHC and chlordane differed markedly among soil types. Soils having a high content of organic matter seem to show less residual toxicity. DDT and BHC for example showed great persistence of toxicity in the soils of the state of Washington in contrast to soils in New Jersey. Apparently, it is not possible to give as yet a clear-cut, decisive answer to the question of harmful residues accumulating from the application of insecticides to soils. Such residues do persist and may harm crops in certain soil types; but, until further studies clarify the situation, it is not possible to make precise statements. "All we poisons, I hope, is the slugs."★

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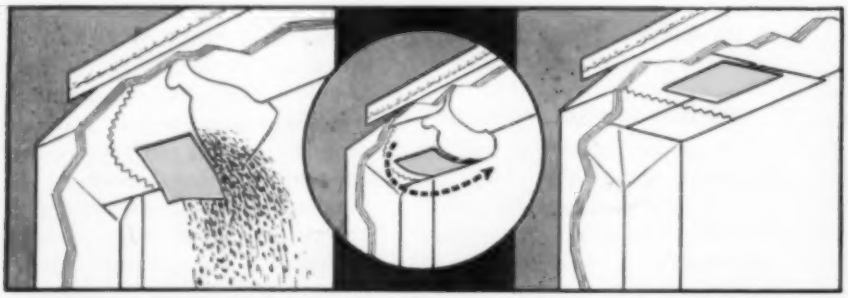

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The AGRICULTURAL Applicator

- Mite Control In Orange Groves
- Windborne Aerosols
- NATA Applicator Survey
- Safety With Phosphates

The use of helicopters and a new chemical has enabled a Florida cooperative to obtain effective citrus mite control. Harvey Sutton (left), co-op production manager briefs pilot Alan B. Dunn of Trans-American Helicopters, Orlando, on specific groves that require treatment. Story on Page 50.

Delnav + Helicopter

A New Chemical And Method For Mite Control In Citrus Groves

Year around preventive spraying for mite control is a costly program that cuts into the profit column. The possibility of applying miticides by helicopter means the grower can wait to treat until he knows where mites are building up in his groves.

By Harvey J. Sutton
Assistant Production Manager
Waverly Growers Cooperative

FOR several years now, we have been eyeing, somewhat enviously, the values of aerial application for citrus mite control, but it is only recently that we have had the suitable chemicals to try our hand at it.

Waverly Growers is one of the large citrus cooperatives in the Lake Wales area of central Florida, representing some 250 citrus growers scattered within a fifty-mile radius of the town of Waverly. We are both a purchasing and a marketing cooperative, and often follow our members' citrus from the time their first tree is planted until the last fruit is harvested, packed, and shipped to Eastern terminal markets.

One of our biggest jobs is production, and here we are responsible for turning out the best quality fruit at the lowest possible cost. This means we must get the most value out of our fertilizer, cultivation, and insect and disease control. All told, it requires some $150 to $200 worth of production resources a year to produce an acre of good citrus. This means an average grower with a hundred acres of citrus may pay as much as $20,000 a season simply to produce a crop. This is a lot of money, and, with the increasing costs of new agricultural chemicals, higher wage rates, and increasing packaging, storage, and shipping charges, we have to work hard to find improved ways of producing the same citrus crop just to come out even. It has led us to look beyond the philosophy of trying to do a better job the same old way, and into the more profitable philosophy of doing the same old job a better way. Aerial application of chemicals, we have found, is one of these better ways.

"Sometimes a grower can spend too much time doing a better job the same old way, when he could be making more profit doing the same old job a better way."

Mr. Sutton examines the leaves of an orange tree for citrus mites.

What does aerial application offer us that makes it so attractive in citrus mite control? First of all, it is basically less costly. A typical drowning application with speed sprayers costs $6 a tank to apply, and an average of two tanks per acre are required for medium-sized bearing trees to obtain good mite control. The cost of insecticides used, of course, is in addition to this. By comparison, a relatively expensive form of aerial application—helicopter—costs only $6 an acre total. This means aerial application at its top price is only half the cost of ground application.

The second big advantage of aerial application is speed. The best entomologists in citrus mite control will say to kill the mites when they are in low numbers. The principle is simple. If there are a million mites in an orchard and spraying controls 99% of them, there still are 10,000 live mites left to reproduce the population. If there are only a hundred mites, however, and 99% are killed, there is only one left, and chances are pretty good this one may die of natural causes before another mite of the opposite sex comes along to start the cycle going again. Now examine the problem. Using speed sprayers, some ten to fifteen acres of citrus can be treated per day. This means, if a grower has several thousand acres of citrus as we do, and begins spraying the minute the first mite appears, even using a fleet of sprayers, as we do, he probably is tackling very large and damaging populations of mites in his groves before he has cov-

ered half the infested acreage. Helicopter applications, however, can cover at least 200 acres a day, and mites can be controlled while they are still in low numbers. On this basis, consistently better results should be obtained by air than by ground, for the applicator is starting with much lower populations on the greater part of the acreage when he attacks the mites.

The only way I know to avoid having mites build up excessively when reliance is placed on ground application, is to use a preventive application program. This method is very effective, particularly under fall and winter conditions, but sometimes hundreds of acres of groves that might never have encountered a mite problem that year have been sprayed. Year round preventive ground applications for mite control, even using the very best of chemicals, is a premium program in citrus, and cuts deeply into the net profit column at the end of the growing season. Aerial application, of course, means the grower can wait to treat until he knows the mites are building up in his groves. When they are, they can quickly be controlled in the groves where control is needed, and nature can wend her quiet, inexpensive way in groves where mites may never be a problem this season.

There are a lot of other advantages to aerial application. It would be far more logical, for example, to pay an airplane applicator a fixed fee to treat citrus than it would for a grower to invest $10,000 in a piece of spray equipment which depreciated before even being taken out of the garage at a rate in excess of the air applicator's fee. Then, too, if air application was used to control melanose as well as mites, its low cost would allow the grower to keep a constant cover of fungicide on new flushes of growth—a practice which is costly with ground application.

These are the things we have yearned for in aerial applications,

Helicopter of Trans-American Helicopters, Inc., Orlando, Fla., hovers at treetop level to provide thorough coverage with Delnav miticide. Another benefit derived from the use of helicopters, according to the author, is the possibility of the pilot's receiving signals from the ground without having to land.

but were unable to take advantage of until the recent introduction of some new miticides.

Our first breakthrough came when we were introduced to Delnav, a new miticide produced by Hercules Powder Company, and which Art Chadwick, Hercules Florida representative, brought to us some two years ago. At that time, we discovered Delnav had a remarkable number of properties which made it ideal for application by air, and it seemed well worth our time and money to see what we could do with it.

First of all, Delnav is a liquid and can be applied in low volumes of water without clogging spray nozzles. Clogging was a serious problem with wettable powders, particularly when as little as five or ten gallons of water to the acre might have to be used. Secondly, Delnav is not particularly volatile and will adhere to the leaf surface rather than evaporate. Because of this low volatility, Delnav is not affected by temperatures, and can be applied on a cool morning, or a hot afternoon, with equal effectiveness. Thirdly, Delnav is a long residual miticide and we could expect it to give mite control for many weeks after it was applied. We had no objection to its being inexpensive either. In addition, Delnav provides excellent control of both the rust and purple mite groups of mites that attack citrus. This was particularly important in fall-winter mite control, for it meant Delnav would do alone what it had previously required two miticides to do. Using only one material meant having that much more space in the helicopter spray tanks, where an extra gallon of unneeded material can be very costly. It was known that Delnav would not injure citrus foliage, even at the extremely high concentrations we would have to use when applying only five gallons of water per acre, and we could conveniently tell if Delnav was drifting into an area where we did not want it to go. It had just enough odor to let you know it was there, but not enough to make you wish *you* weren't!

Our big question was whether or not Delnav would give sufficiently good mite control by air to make up for the less thorough coverage usually obtained by air. Since the amount of spray applied by air is only a fraction of that applied by ground equipment, we doubted that coverage would be as good as we were used to. We

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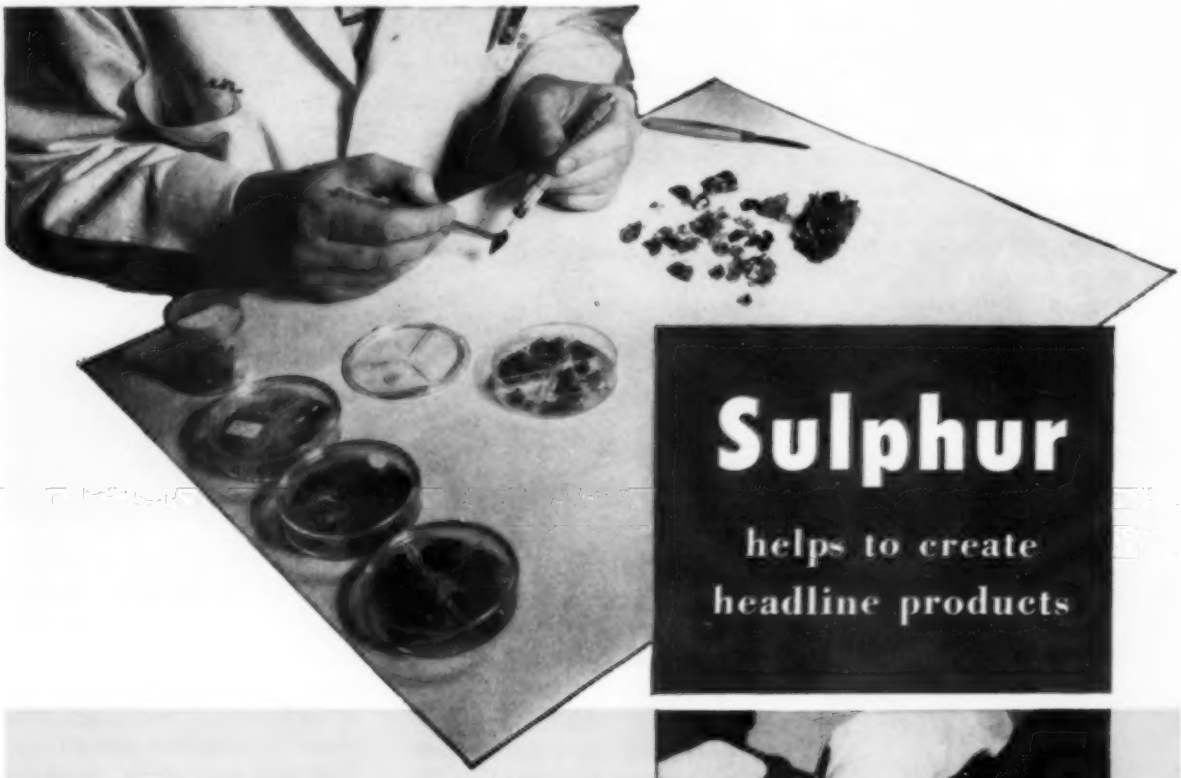

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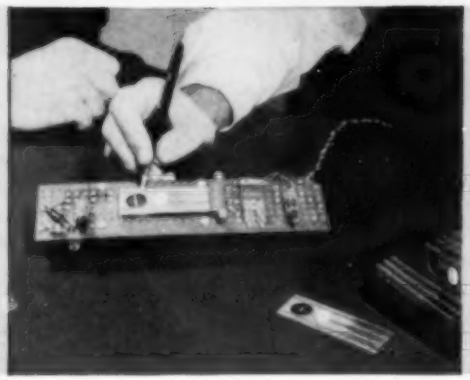

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Applying Windborne Aerosols

Machines for applying windborne aerosols are different from those that project sprays with a powerful air blast. Insect control attained from windborne aerosols applied to field crops and orchards is due mostly to the deposit. For satisfactory performance, however, an aerosol cloud must be released under proper weather conditions.

This article is taken from ARS Bulletin 33-57, June 1960, by Alfred H. Yeomans, Entomology Research Division, Agricultural Research Service, USDA.

FOR satisfactory performance, a windborne aerosol cloud must be released under proper weather conditions. A light wind, steady in direction, and moving at ½ to 8 miles per hour, is needed. Winds slightly stronger than 8 m.p.h. can be utilized when the cloud is drifted uphill or when an orchard or other area with a high canopy is treated.

A time of day should be selected when there is a surface inversion of temperature—i.e., when the air temperature is cooler at the ground level than at a height of six feet or more. Surface inversion keeps the aerosol cloud close to the ground and is more important when lowgrowing crops are treated and least important when trees having a canopy of foliage are treated. Good inversion usually occurs only at night, from one hour after sunset until sunrise, but occasionally exists all day when the ground has been cooled by rain. In hilly terrain, surface inversions usually occur only in the valleys. If it is necessary to make treatment in the daytime without the surface inversion, a wind of 5 to 10m.p.h. is beneficial.

Machines for applying windborne aerosols are different from those that project sprays with a powerful air blast. The air-blast machine can provide a more nearly uniform deposit across a swath with the larger spray particles than can be obtained with the windborne aerosol machine. Insect control attained from windborne aerosols applied to field crops and orchards is due mostly to the deposit. However, if the aerosol is applied while the insects are in flight, individuals on the wing are killed as well as those that come in contact with the deposit.

Aerosol particles, moving with the wind, deposit selectively on exposed vertical surfaces, but settle uniformly on horizontal surfaces. Under similar conditions, the deposit is much greater on objects of narrow width, such as pine needles, than on ones of greater width, such as maple leaves. The deposit on vertical surfaces becomes important when the aerosol is applied in winds stronger than 5 m.p.h., and on small, tender foliage it sometimes is heavy enough to cause injury. When a large proportion of the foliage is exposed vertically, as in a vineyard, the increased deposition is especially important.

The deposits of aerosols of different particle size released in a 3 m.p.h. wind, under good inversion conditions, are given in table 1. These deposits settled on an open field; the percentage would have been higher if the aerosol had been released through dense foliage.

The swath width is chosen first by the locations in the crop through which the machine can be taken with the least damage from its wheels. The minimum swath width is limited by the particle size requirements. A narrow swath requires large particles to settle out in the swath. Large particles sometimes cause foliage injury when oil solutions are used. The maximum swath width is limited by the dosage requirements. A wide swath requires a heavy output from the machine. Too heavy an output, even though the particle size is small, will cause foliage injury because of the heavy deposit near the source. Because the smaller particles are difficult to deposit efficiently within a limited area, it is best to select a swath as narrow as possible without causing too much damage from the wheels of the machine or foliage injury from large particles.

The proper particle size depends on the swath width the aerosol is expected to cover, the wind velocity, and the amount of foliage penetration required. After the swath width has been chosen, the particle size that will give 25 to 50

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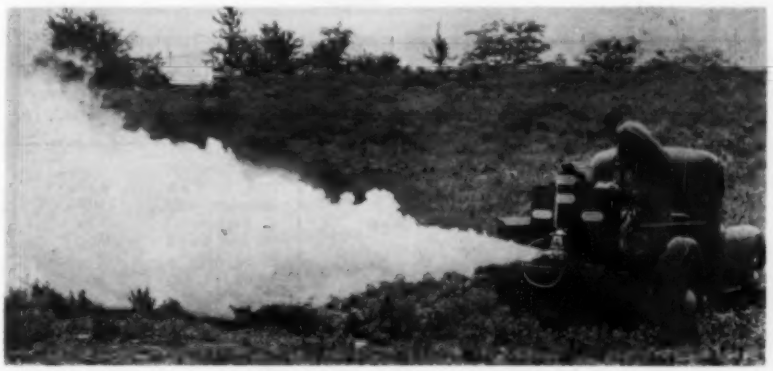

CAAA Warns Applicators To Observe Safety Rules

A RASH of poisonings from phosphates in the Kern County, California, area last month prompted the California Agricultural Aircraft Association to issue a special safety bulletin warning aerial applicators to observe safety precautions meticulously.

Phosdrin and TEPP are *true* phosphates, the bulletin points out, and, therefore, do not have to convert into phosphates in the human body. "When your blood level has been knocked down by the other phosphates which accumulate in your system," the bulletin continues, "Phosdrin and TEPP are the knock-out punch which hits fast and hard."

There were 27 swampers treated in Kern County hospitals during the last week in June and the first week in July. In addition, seven pilots were not permitted to fly because of low blood cholinesterase levels.

The problem was brought about by an outbreak of army worms in the Kern County seed alfalfa, hay, and cotton fields. Because of residue problems, 99 per cent of the pesticide materials applied to those crops were phosphates. On blooming crops, this application of phosphates brought on a shorter working period, in order to protect bees. The use of Phosdrin on seed fields, therefore, was restricted to morning applications.

Because the applicators attempted to control the pests on as many acres as possible during the allotted time, a certain amount of rushing was experienced. This increased the hazard of mixing and applying phosphates because the workmen were not always using the necessary precautions of keeping their clothes clean and washing all exposed skin areas with soap and water as often as they should.

Rubber gloves are an absolute must for swampers, the bulletin advised, and a good, approved respirator also was recommended. According to the manufacturer of the pesticide, the first choice of respirators was the American Optical Co.'s respirator No. 5058, with filter cartridge combination R-58. The mask should be cleaned in soap and water at the end of a working period and, when not in use, it should be stored where it cannot become contaminated.

The bulletin further advises, however, that respirators are not the complete answer. Most of the poisonings were the result of skin absorption. The use of good rubber gloves and rubber boots for swampers was strongly recommended as were an uncontaminated loading area and clean clothes and bodies.

An incident was reported in the bulletin in which an operator arrived on the scene to check loading operations of Phosdrin. His swamper was proud of the "safety equipment" he was using: good rubber gloves, rubber apron, respirator with new filter, and soap and water handy in case of emergency. He stood, however, in about four inches of mud (made by spillage from the mix) — wearing a brand new pair of tennis shoes.

The bulletin, prepared by Bob Bunch, CAAA director of safety, closed with a warning to operators that they had better maintain a close supervision of loading operations.

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86 Million Acres Covered In 1958 Aerial Operations

NATA Survey

A profit of $19 million was realized by aerial applicators in 1958, according to a NATA survey just released. The average applicator made a profit of $10,500 and treated 46,600 acres.

The survey was conducted early in 1959 and the results were released late last month.

AN estimated total of 86,000,000 acres were covered by aerial applicators in spraying, dusting, fertilizing, and seeding operations in 1958, according to a survey of aerial application operations released last month by the National Aviation Trades Association. The average aerial operator alone covered 46,600 of those acres.

The survey was conducted early in 1959 and returns were received from about one out of each 12 operators, a sample that is not large enough to produce strong statistical data, but general impresssions and approximate levels of activity can be determined. The analytical work on the survey was carried out by Dr. Kenneth Razak, dean of the University of Wichita's engineering department.

Returns were received from 35 states. More than one-half of the operators specified that they remained in their home state. Of those who indicated operations in more than one state, the majority restricted their operations to two or three states. The trend toward the development of a local business was identified by the operating radius. Those operators indicating operations in only one state reported an operating radius of 30 to 60 miles. Where operations were reported in more than one state, the radius of operations ranged up to 1,000 miles.

The gross income produced from these operations was estimated to be $147,000,000, on which a profit of $19,400,000 was realized. The nature of this profit is not precisely known but, judging from the number of one-man and one-plane operators, a suspicion exists that some of these operators did not deduct a salary for themselves but considered the excess of income over direct expenses as profit. No estimate can be made as to the profit when measured as a return on investment.

The total assets of the industry are about $110,000,000. Net income in 1958 for the industry was $96,000,000. A surprisingly low number of operators report that they borrow much money each year. The ratio of net worth to assets is .88. The profits were a resounding 20 per cent of net worth. The average operator had a gross income of $80,000, on which he realized a profit of $10,500.

Thirty per cent of the operators indicate that they do not furnish a package deal to customers. The rest predominantly favored a package deal or accommodated the desires of the customer, and 60 per cent of the operators furnished advice or specified the chemical that was to be used on the farmer's crops.

The operators were almost unanimous concerning the use of county agents. All indicated that they asked for his services and, with very few exceptions, the county agent proved to be cooperative.

Seventeen per cent of the operators state that they carry an insurance which protects the grower. Only 12 per cent of operators reported damage claims against them. Claims involved bodily injury (17%), property damage (40%), and drift (43%). The bodily injury claims averaged $3,640,000, the property damage claims averaged $320, and the drift claims averaged $836. One-third of the claims were covered, at least partially, by insurance. All were settled out of court.

Operators in 13 of the reporting states indicated that no state association of agricultural operators existed. For those states in which an operators' association did exist, however, the membership was almost unanimous. A few operators reported that they did not belong to a state association because one did not exist in spite of the fact that other operators reporting from the same state did belong to the association.

More than 80 per cent of the operators indicated that their business was 100 per cent agricultural aviation. Even those who reported other activities indicated that these activities comprised only from 10

(*Continued on Page* 87)

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PEST ROUNDUP

By Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

Heavy Insect Populations Spotted Throughout United States

DURING June, the black cutworm caused damage in widely scattered areas of the United States. In Maryland, a severe outbreak occurred on young corn throughout the state. Treatment was required in many fields and some replanting was necessary. Corn in Pennsylvania, corn and tobacco in localized areas of Ohio, and corn in many areas of Indiana were seriously infested. Damaging infestations in corn also were reported from areas of Illinois, Missouri, and Oregon. Many of these infestations were treated. Black cutworms or other cutworm species also were of concern, often requiring control measures, in western Iowa, and in local areas of Wisconsin and Virginia. Nebraska reported damage as high as 50 percent in 40 percent of cornfields examined in 8 counties.

Localized treatments for armyworms were required in wheat in Illinois, Missouri, Oklahoma, Kansas, and Nebraska.

Infestations of the alfalfa weevil were heavier than normal during last June in three eastern Oregon counties. Poor control was obtained with insecticides applied at recommended dosages. In localized areas of Idaho and Montana, the insect caused heavy injury and treatment was required to prevent excessive damage. The pest was common on alfalfa throughout Utah, with the condition becoming progressively worse during the month of June. Some growers cut the crop for control, while several thousand acres of alfalfa were treated. Although larval populations were dropping by mid-June in Colorado, counts were still running 2,000-3,000 per 100 sweeps in Garfield and Delta Counties. In several areas, first cuttings of alfalfa were made early to reduce populations.

The alfalfa weevil also was active in the eastern part of the United States. Although pupation was well underway by mid-June in New York, some localized fields still had counts of up to 100 larvae per sweep. In Jefferson and Berkeley Counties, West Virginia, tonnage yield of alfalfa was reduced at least 50 percent by the alfalfa weevil. In these two counties the weevil and pea aphid also reduced the food value of the alfalfa to a point where total loss to the first cutting was estimated to be 75 percent. The weevil was active also in Massachusetts, Pennsylvania, Maryland, and Delaware. Five North Carolina counties were reported infested for the first time in June. Dawson County, Nebraska, was reported infested during the month, thus giving further eastern spread of the insect from the west.

Although grasshoppers were generally light during June, several areas did report some damage. In California, considerable damage occurred to barley plantings in the Tule Lake game refuge, Siskiyou County. Some control was being planned by individual operators in McCone County, Montana, and threatening populations were found in some areas of western North Dakota. In eastern Wyoming, counts up to 35 per square yard were recorded on rangeland, while in Box Elder County, Utah, counts as high as 300 per square yard were recorded. Grasshopper populations up to 50 per square yard were found on conservation reserve lands in Alamosa County, Colorado. Damaging populations of grasshoppers were present on forage crops, cotton, gardens, and roadsides in many sections of Texas. In Swisher County, checks in a limited area showed populations as high as 60 per square yard in fields and 300 along roadsides.

The meadow spittlebug was quite heavy on legume hay in southwestern Pennsylvania during mid-June. Less spraying was carried out than in the past probably due to the cost. Rosetting of alfalfa plants was common throughout Berkshire County, Massachusetts, and adults were common in red clover and alfalfa fields in most sections of Maryland. Very heavy spittlebug infestations were reported from eastern Indiana counties and counts up to 10 per sweep were recorded from west and west-southwest Illinois.

Among the fruit pests, aphids, the oriental fruit moth, and mites caused concern in various areas. By the latter part of June, the apple aphid populations in Maine remained spotted but were on the increase. Some increase was noted in the Carbondale, Illinois area and close watching was advised. In New Jersey, the rosy apple aphid was more numerous than for several

(Continued on Page 90)

WASHINGTON REPORT

By Donald Lerch

NOW that the conventions are over, major attention of industry leaders here is being turned to the August session of Congress. With both parties jockeying for advantage in November, observers feel that the current session which will open shortly deserves the closest possible attention. A particular danger is that in a bid for "conservation votes," Congressmen might ram through some legislation unfavorable to the pesticide industry that in calmer times would fall by the wayside.

No one is expecting much more than a lot of talk to come out of the session so far as new farm legislation is concerned. Bills may be introduced to carry out party platforms, but it's a foregone conclusion that any Democrat bill will be vetoed, and any Republican bill will be killed in Committee.

Farm leaders we've talked with feel that so far neither party has shown leadership in the farm field. They're looking for some indication as to who may be the next Secretary of Agriculture. This, they say, and not party platforms, is the key to the kind of farm programs we will have during the next four years.

* * * * *

Pesticide Industry officials attending the NAC's 27th annual meeting in California in September will notice a radical change in the usual programming. Until this year formal sessions were held on the mornings of the first and third days, while the second day was left free for committee meetings.

This year all formal meetings will be held on the first day, the second day will be free except for the annual banquet, and the third day will be devoted to committee meetings. Idea is to boost attendance at both the formal sessions and the committee meetings. The program for the first day has all the elements of general appeal.

Significantly, almost the entire emphasis of this year's NAC program will be on the safety of currently available pesticides, their use in world health programs to save millions of lives, their incalculable contribution to our food supply, and the public relations means for getting this story to the public.

One feature listed as "NAC In Action" may turn out to be one of the biggest hits of the program. This will be a top-notch graphic report of what NAC is doing for the Industry and how industry members can make more money by taking greater advantage of NAC programs.

* * * * *

The trend toward improving communications with members is high on the agenda at the National Plant Food Institute, too. Two main efforts at NPFI this coming year will be an expansion of the highly successful soil fertility program and increased work to let members know what NPFI is doing so they can take better advantage of all NPFI programs.

* * * * *

Relatively little attention has been paid to current USDA research efforts to find safer chemicals and safer methods of application of currently available materials. This trend should not be underestimated. It has the approval of top officials in Agricultural Research Service, in USDA, and in Congress. Over the next few years millions of research dollars will be spent in this field, most of it in laboratories abroad.

Already USDA scientists are coming up with a male gypsy moth lure. If attractants now isolated can be produced synthetically, control of the gypsy moth—which caused such a hostile public outbreak against pesticides two years ago—may be shifted to the use of attractants and traps.

* * * * *

National Agricultural Chemicals Association officials are watching closely the development of special State committees to study the potential hazards of pesticides. Already a committee headed by University of Wisconsin President Dr. C. A. Elvehjem has developed two sub-committees, one on chemicals and water supplies, the other on chemicals and wildlife and forestry. California's Governor Edmund G. Brown also has appointed a special committee to study pesticides.

Some industry leaders are disappointed that Gov. Brown's committee is heavy on toxicologists and medical men, but light on authorities on pesticides.

Both states express the view that a clear, consistent, firmly established public policy on the use of pesticides is needed on a state-

wide and, we might add, on a nation-wide basis. NAC's new booklet "Pesticides and Public Policy" is aimed toward reaching that objective.

* * * * *

At a quiet meeting in the U.S. Department of Commerce recently, Commerce officials tried to stimulate fertilizer and pesticide industry leaders into stepping up their overseas sales of chemicals. Foreign sales, while sizable, have never held the interest of many producers in either the fertilizer or pesticide field. Evn those relatively few companies which do a modest export business are currently running into mounting roadblocks to sales.

Commerce Department officials are holding routine meetings with all kinds of producers to boost overseas sales in an attempt to stem the outflow of U. S. gold. By and large these meetings have not been successful. One complaint, heard from Pesticide Industry leaders, is that our Government has not yet realized that other Governments subsidize exports, and otherwise promote overseas sales as a national policy.

Although the U. S. Government is yielding to businessmen's need for easier credit through the Export-Import Bank and other channels, the job of carrying on business abroad is getting tougher rather than easier. Last year, the Commerce people said, fertilizer exports were about $108 million, and pesticide exports about $86 million. A significant amount of the pesticide exports were accounted for by materials sold to the U. S. Government here and shipped abroad for use in foreign public health programs.

Other factors Industry spokesmen cited as cutting down U. S. exports are bilateral trade treaties between foreign governments and the Communist bloc, which are increasing, and overseas farmers' lack of appreciation of how much U. S. agricultural chemicals can do for them.

A comment from one fertilizer industry representative was to the effect that it's nice to know that the Government wants us to export more, but little aid has been offered to make any large increase in exports a reality.

* * * * *

Watch for more emphasis by both the fertilizer and pesticide industries on non-farm home markets. We have talked about the potential in these markets for years. Now, by disclosing the really tremendous move of people into suburban homes, with their lawns, trees, flowers and vegetable gardens, the U. S. Census is spurring industry action.

Unofficial spokesmen for the fertilizer and pesticide industries estimate that about 10 per cent of their sales already are in non-farm markets, in terms of volume, and from 12 to 15 or more per cent in terms of dollars. Unsatisfied with general estimates, the National Plant Food Institute has been making surveys of the actual situations. Surveys on non-farm home use of fertilizer in New England, the Middle and South Atlantic already have been completed. Results of a survey now underway in the Middle West are expected late this year.

* * * * *

The Food and Agriculture Organization's long-heralded "Freedom from Hunger" campaign has been launched, but since the launching took place in Rome, little has yet been heard here about the program. This lack of communication is disappointing, because the "Freedom from Hunger" campaign is of major concern to everyone in agricultural chemicals.

FAO Secretary General B. R. Sen has pointed out that unless food production can be stepped up, we may be faced with disastrous famines in many areas of the world. Such events will not only affect many millions of people, he said, but also the peace of the world as well. What he foresees is the prospect of so increasing food production throughout the world that men will be freed from hunger.

Within the fertilizer and pesticide industries are many of the technical means of bringing about this needed upsurge in food production, not on a charity basis, but on a basis of mutual benefit. All that is neded now is an industry statesman to open the door to a vast expansion in the use of all agricultural chemicals throughout the world.

FAO's "Freedom from Hunger" campaign has the support of most, if not all, the heads of Government in the free world, including that of President Eisenhower.

* * * * *

Industry could learn a lot by the way conservationists handle groups such as the General Federation of Women's Clubs. They not only maintain close contact with GFWC's Conservation Committee Chairman year after year; this year they also took part in a conservation tour set up for some 60 GFWC's officials following the organization's annual convention here in Washington.

The tour included entertaining national, regional and state women's club officers and conservation chairmen and committee members in the new National Wildlife Federation headquarters building. Speakers included HEW Secretary Arthur S. Flemming and Dr. Ira Gabrielson, head of the Wildlife Federation.

With this kind of top level treatment, it is no wonder that the women's clubs tend to back conservation policies, including those harmful to the proper use of pesticides. As some leaders here have commented, the Pesticide Industry has a right to claim major contributions to the furthering of conservation. The problem is that its voice has not been raised loud enough in the right councils to gain its rightful recognition in this field.★★

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1843 – Copper discovered near Ducktown, Tennessee
1850 – First mine opened at Ducktown
1872 – First use of the new machine, the diamond drill, and of new explosive dynamite
1901 – First pig copper produced at Copperhill
1907 – Sulfuric Acid first produced at Copperhill
1922 – Copper Sulfate production begins
1954 – High purity Industrial Copper Sulfate by vacuum process first produced

1922— Copper Sulfate production begins

. . . And we've been at it ever since, providing our customers an uninterrupted supply of 99+% pure Copper Sulfate through wars, through shortages, throughout the years. If Copper Sulfate is important to your operation, may we suggest Tennessee Corporation?

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LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, USDA, Beltsville, Md.

Trials With Dodine For The Control Of Pecan Scab

JOHN R. Cole (1), of the United States Department of Agriculture, Agricultural Research Service, compared dodine (*n*-dodecyl-guanidine acetate 70%) with certain other materials for efficiency in the control of pecan scab (*Fusicladium effusum*) in Georgia. Dodine had given excellent results in preliminary experiments in 1958, and was therefore included in trials on trees of the Schley variety in 1959.

Weather conditions in 1959 were exceptionally favorable for scab infection on both leaves and nuts. According to Cole, scab was a threat throughout the 6-month period of nut development, from April through September. During July, the wettest month, leaves and nuts were seldom dry, and at times the very wet ground hampered the operation of the spray machines. Such a scab-favorable season, of course, provided severe test conditions for control chemicals.

Materials tested, besides dodine, were ziram (zinc dimethyl dithiocarbamate), zineb (zinc ethylene bisdithiocarbamate), and bordeaux mixture 4-1-100. Dodine, ziram, and zineb were used at the rate of 2 pounds per gallon. The application schedule for all materials included 2 prepollination and 4 cover sprays; dodine was used also in a shortened schedule from which the last 2 cover sprays were omitted.

The yield and size of nuts obtained, clearly showed the superiority of dodine. The average yield of trees given 6 applications of dodine was 88 pounds per tree of nuts, averaging 67 per pound; with 4 applications, dodine-treated trees produced 41 pounds per tree of nuts, averaging 89 to the pound. Corresponding figures for other treatments were: bordeaux mixture, 10 pounds per tree, 91 nuts per pound; ziram, 8 pounds per tree, 109 nuts per pound; and zineb, 13 pounds per tree, 93 nuts per pound. Untreated trees averaged only 1 pound per tree of very small nuts, 120 to the pound. Most of the nuts on the untreated trees were badly scabbed, and most of those on trees sprayed with materials other than dodine were affected to some extent. In contrast, about 75% of the nuts on dodine-sprayed trees (6 applications) were free from scab.

Cole compared incidence of scab in 1958, when rainfall was moderate, with incidence in the very wet year 1959. In 1958, all treatments gave commercial control of scab, and the average yield of untreated trees was 13 pounds. In 1959, the disease was more severe and destructive than in any other year since 1949.

Evaluation of Fungicides

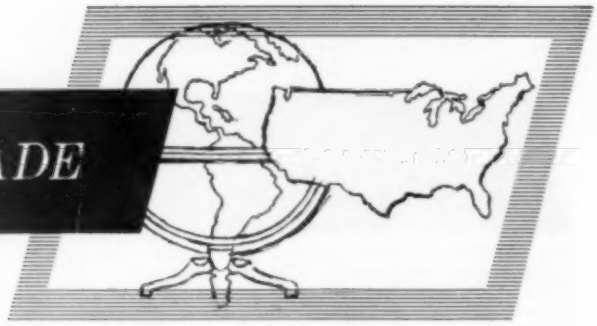
When sulfur-containing fungicides were used on apple trees to control scab (*Venturia inaequalis*), powdery mildew (*Podosphaera leucotricha*) was not considered a problem, according to Harry L. Keil and Roy A. Wilson (2), of the United States Department of Agriculture, Agricultural Research Service. In amounts usually applied, however, sulfur often caused severe enough injury, under certain conditions, so that growers preferred to use other materials. Some of the organic chemicals efficiently controlled scab and other diseases but did not affect powdery mildew, which thus was free to increase in prevalence and severity and, in time, develop into a serious control problem. According to Keil and Wilson, it has become necessary either to resume the use of sulfur in apple spray schedules or to find some other effective and economically practical material for controlling powdery mildew.

With this in mind, Keil and Wilson designed field experiments at Beltsville, Maryland, primarily to determine whether powdery mildew might be controlled by lower and safer dosages of sulfur and to compare the effectiveness of sulfur at such low rates of application with that of certain other materials. The effectiveness of 2-(1-methylheptyl)-4,6-dinitrophenyl crotonate (Karathane) in powdery mildew control had been demonstrated. Dodine (*n*-dodecyl-guanidine acetate) had shown some indication of activity against powdery mildew and was known to be very efficient in control of scab.

The materials tested, and amounts per 100 gallons of water, were: micronized wettable sulfur, 2, 1, and 0.5 pounds; 2-(1-methylheptyl)-4,6-dinitrophenyl crotonate WD (25%), 0.5 pound; the 25% crotonate, 0.25 pound, plus dodine (65%), 0.5 pound; a 48% liquid concentrate of the crotonate, 0.25

(*Continued on Page* 92)

NEWS about the TRADE



Rohrer Named By Grace

William M. Rohrer has been appointed assistant sales manager, agricultural chemicals, by the Davison Chemical Division of W. R. Grace & Co., Baltimore, Md.

Mr. Rohrer joined the Davison Division in 1954, following assignments with Naco Fertilizer Co. and Thurston Chemical Co., Grace subsidiaries, as purchasing director. With Davison, he has handled domestic sales of triple superphosphate and export sales of agricultural chemicals.

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Hazardous Labels Bill

Chemical companies which make and package hazardous household products now must see that the labels conform to new government regulations contained in the federal hazardous substances labeling act, S 1283.

The new law, which provides companies with six months in which to comply, is limited to products that are "hazardous" and packaged for household use, except for any economic poisons subject to the insecticide, fungicide, and rodenticide act; foods, drugs, and cosmetics subject to the food, drug and cosmetic act; and certain other products.

•

Texas Applicators To Meet

The Texas Aerial Applicators Association has announced that its 1960 meeting will be held Nov. 3 to 6 at the Echo Motor Hotel in Edinburg, Texas. A demonstration and air show are planned.

NAC Program To Feature Residues and Safety

PESTICIDE residues and safety are two of the main topics to be discussed at the Sept. 27 to 29 meeting of the National Agricultural Chemicals Association to be held at Hotel del Coronado, Coronado, Calif.

Among the subjects to be covered are: "The Reasonable and the False Issues of Carcinogenicity," by Dr. Hardin B. Jones, Donner Laboratory of Medical Physics, U. of California, Berkeley; "Pesticides —Vital to World Health," by Dr. Henry van Zile Hyde, chief, division of International Health, Public Health Service, U. S. Department of Health, Education, and Welfare; and "Pesticide Safety Makes Sense," by Dr. Alfred Boyce, director of the Citrus Experiment Station, University of California, Riverside.

Jamie L. Whitten, Congressman from Mississippi, will present a luncheon address entitled: "Chemicals and the Food Supply."

Also featured on the meeting program is a panel discussion, to be moderated by Jack Dreessen, NACA. The panel's topic is public relations in the 1960's. Members of the panel are: George K. Johnson, public relations manager, Monsanto Chemical Co.; Wally Erickson, president, National Association of TV and Radio Farm Directors; John E. Pickett, editor of California Farmer; and Donald G. Lerch Jr., Donald Lerch, Jr. & Co.

Named Technical Director

John C. Fedoruk has been appointed technical director of Allied Chemical's General Chemical Division, New York. He succeeds Dr. Howard H. Hurmence, who recently was named assistant director of research and development for the corporation.

With the division 19 years, Mr. Fedourk was assistant technical director for the past six. Earlier he had served as manager of General Chemical's development laboratory at Baton Rouge, La., and as a research chemist at its plant in North Claymont, Del. Mr. Fedoruk currently is headquartered at the General Chemical research laboratory in Morristown, N. J.

•

Linderman Joins Davison

Robert H. Linderman has joined W. R. Grace & Co. Davison Chemical Division as manager of phosphate rock sales and long range planning in agricultural chemicals.

He had been product manager, phosphate rock, for International Minerals & Chemicals Corp.

•

ASA Meeting Dec. 5 to 9

The American Society of Agronomy will hold its 1960 meeting Dec. 5 to 9 at the Morrison Hotel in Chicago.

•

Fibre Drum Plant Opened

A fibre drum manufacturing plant has been opened by the Continental Can Co., New York, in Carteret, N.J. The plant will produce two kinds of fibre drums for dry products.

To be made at Carteret are the Leverpak, with capacities of 12 to 75 gallons, and the Stapak, with capacities of 2 to 35 gallons.

Expects Fewer Farms By '70

About 750,000 farms will go out of business during the 1960's, Burton F. Bowman, assistant general manager of American Cyanamid Co.'s agricultural division, told a national conference of the American Marketing Association in Minneapolis, June 16.

He said that this development won't necessarily be bad since the shrinkage in total number of farms will mean that the farms left will grow larger and more efficient.

Another important influence on agriculture in the 1960's, Mr. Bowman said, will be vertical integration, which tends to accelerate specialization of output, reduce the number of farms, and increase their size.

•

V-C Names Three

Virginia-Carolina Chemical Corp., Richmond, Va., has named to new positions three men in its Fertilizer Division.

W. M. Atkinson has been named assistant general sales manager; Stan K. Thomsen has been named assistant to the manager of the company's Fort Wayne, Ind., sales office; and J. D. Moseley has been appointed assistant to manager in Shreveport, La.

•

Eradication Program

Cattle fever ticks, found recently in Florida for the first time since 1957, are the target of a Federal-State eradication program now underway. The Florida Livestock Board and USDA's Agricultural Research Service are cooperating in the program.

A quarantine has been placed on three counties on the Florida east coast.

•

Weed Control Conference

The 1960 annual North Central Weed Control Conference will be held at the Hotel Schroeder in Milwaukee, Wisc., Dec. 12 to 14.

•

Named FMC Vice President

Henry S. Winnicki has been named vice president of the Chemical Division of Food Machinery and Chemical Corp., New York. He had been manager of FMC's chemicals and plastics division.

•

Bemis Shifts Williams

A. B. Williams, manager of sales for the western operations of Bemis Bro. Bag Co. in San Mateo, Calif., has been transferred to the St. Louis, Mo., general sales department. He joined the company in 1942.

•

CSC Names Jolley

R. Paul Jolley has been named manager of the Atlanta district office of Commercial Solvents Corp., New York. He joined CSC in 1959 as a sales representative for the company's agricultural chemicals department.

The Atlanta district is comprised of Florida, Alabama, Georgia, South Carolina, and North Carolina. Prior to joining Commercial Solvents, Mr. Jolley was associated with the Georgia Department of Agriculture and the Virginia-Carolina Chemical Corp.

•

To Head G. L. F. Division

John R. Porter, director of the Plant Food and Seed Division, Farm Bureau Service Co. of Iowa, will become manager of G. L. F. Soil Building Division when John C. Crissey retires Dec. 31.

Mr. Crissey, Soil Building Division manager since 1941, joined G.L.F. in 1925. He is president and a director of Fertilizer Manufacturing Cooperative, Inc., Baltimore, in which G.L.F. is an investor. Mr. Porter has headed fertilizer operations of Iowa company since 1957.

•

India Seeks Self-Sufficiency

The Government of India, through the country's third five-year plan, is seeking to achieve self-sufficiency in food.

Plans have been drawn up for the manufacture of about one million tons of nitrogenous fertilizer and the government intends to spend large amounts on irrigation works. Also regarded as essential to increased production, by Food Minister S. K. Patil, is the supply of good and proper seeds and insecticides.

Lux Fills New PCA Post

George A. Lux has been named to the new position of chief industrial engineer for Potash Company of America. His headquarters are at Carlsbad, N. Mex.

•

Loan Rates "Clear" MH-30

In the most recent move in the controversy regarding the use of maleic hydrazide by tobacco growers for sucker control, Naugatuck Chemical division, U. S. Rubber Co., has announced that the recent announcement of grade loan rates for the 1960 flue-cured tobacco crop by the USDA has "officially cleared the way for use of MH-30 on the flue-cured crop."

"The statement on loan rates made it clear that there would be no discrimination against flue-cured tobacco treated with MH-30 either through a price discount or by tagging," said Dr. H. Douglas Tate, manager of agricultural chemical research and development for Naugatuck, developer and manufacturer of MH-30.

It had been reported that the USDA received "strong protests" against the use of maleic hydrazide from major tobacco companies.

•

Chemagro Importing Dylox

Chemagro Corp., Kansas City, Mo., is resorting to a continuous "airlift" of charter flights by KLM cargo planes to import Dylox technical material from Farbenfabriken Bayer, A.G., Leverkusen, Germany, to the U.S. for formulation by Chemagro.

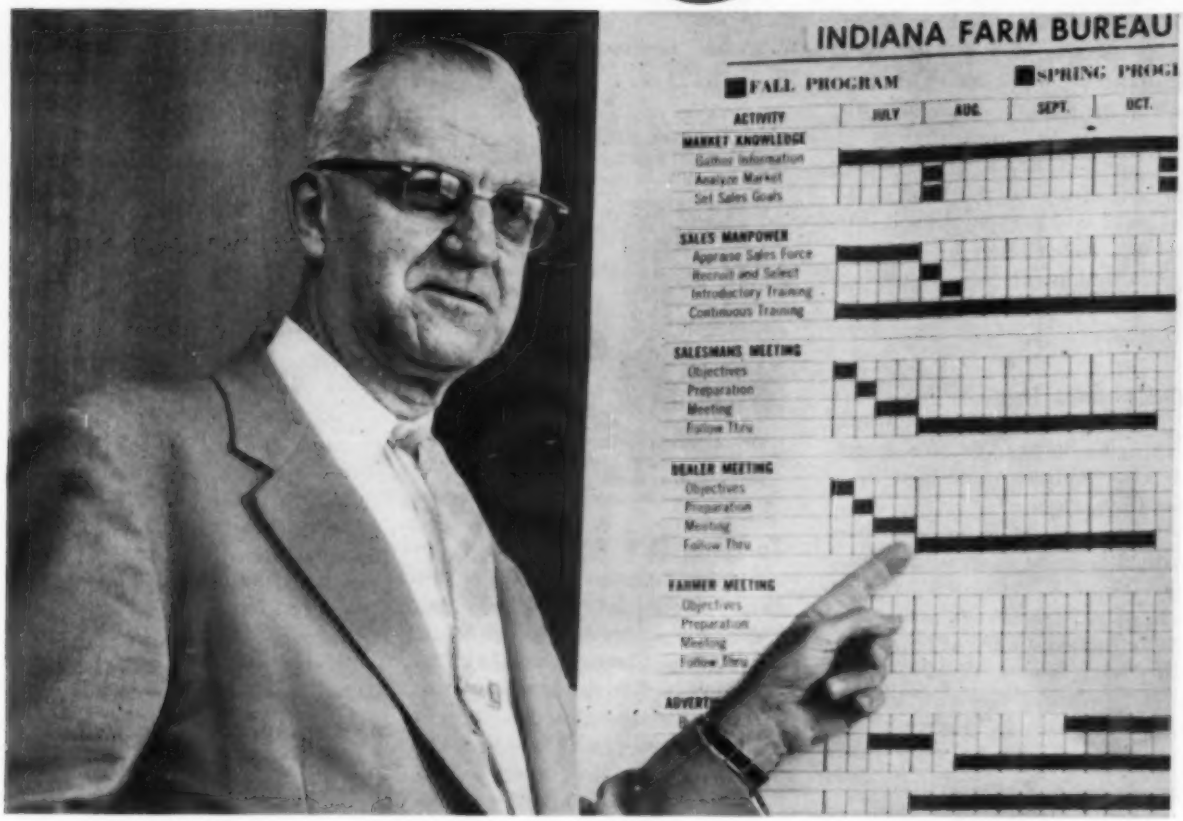
Chemagro anticipates an increasing demand for Dylox by sugar beet growers. The material also is in use in California for controlling pests of cotton and alfalfa.

•

Houghton Heads Sales

William E. Houghton has been appointed sales manager for basic industrial chemicals produced by Allied Chemical's General Chemical Division, New York. Among the products for which Mr. Houghton handles the sales is phosphoric acid.

"Progress



A. R. Mullin, fertilizer department manager, uses "Planalyzer" wall chart to coordinate everyone's work.

Mullin and Indiana Farm Bureau production manager Melvin Leach collect and interpret selling and marketing information . . . schedule additional conferences.

Well-organized sales meetings such as this were made possible through proper preparation and sufficient lead time.

Indiana Farm Bureau's fiscal year, efficiently organized and on paper, hustles projects through the works in an orderly fashion.

on Paper"...

That's what many users call IMC's Planalyzer

This marketing aid coordinates planning of sales activities for better business management . . . here's how one fertilizer marketing team used it to advantage.

The story began late in 1958 when the manager of the Indiana Farm Bureau fertilizer department, Mr. Arthur R. Mullin, and IMC representative Mr. George Urbanis discussed the fertilizer sales outlook for the coming year.

Urbanis introduced Mullin to a newly developed IMC marketing tool called the "Planalyzer" . . . a practical visual planning calendar specially tailored to fertilizer marketing.

Mullin called a planning meeting

with his production, field service and advertising managers. Using the "Planalyzer" forms they blocked out sales seasons. Market research was scheduled. Next activities and promotion were planned to make the most of the selling season. Field sales meetings were scheduled. Purchasing, warehousing and manufacturing activities were geared to mesh with all other fertilizer department operations. Then after "Planalyzer" forms were completed, they were mailed to IMC for enlargement into a wall chart.

"Best program we ever had!"

At the end of the year Mullin stated, "We've always had a program, but this year it was on paper and organized. The "Planalyzer" helped coordinate everyone's work . . . encouraged planning and project scheduling. It also helped build a realistic sales goal. We had enough lead time so we didn't get into crash programs."

AGRICULTURAL CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

IMC

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PRODUCTS FOR GROWTH®

®TRADEMARK

Indiana Farm Bureau's advertising manager, Eugene Holcombe, and his art director develop a solid campaign — in plenty of time — that helps spark successful selling.

Now, the most complete business tool ever from IMC . . .

NEW IMC ACTION CALENDAR — a bigger, more comprehensive marketing and production tool for the 1960-61 sales season. It distills successful experiences of dozens of fertilizer manufacturers into an effective, new IMC Full-Orbit Service. In addition to market research, advertising and other promotion, the ACTION CALENDAR blankets all fertilizer manufacturing and technical activities. Your IMC representative will call on you soon to introduce the new ACTION CALENDAR to you and your staff.

FO-1-01

To Manufacture For Collier

Collier Carbon and Chemical Corp., Los Angeles, has entered into a phosphoric acid manufacturing agreement with the Bunker Hill Co. Under the agreement, Bunker Hill will manufacture for Collier a new product, to be called "ALP" (anhydrous liquid phosphate).

A new process and plant design developed by Collier will be used in the operation at Bunker Hill's recently-completed phosphoric acid plant in Kellog, Utah. Initial production of ALP, scheduled for early 1961, will be used by Collier in the manufacture of its liquid fertilizer, 8-24-0, and new higher analysis liquid and solid phosphates.

•

Pyrethrum Production Up

Kenya's pyrethrum production during 1959-60 is estimated to have reached 14.3 million pounds, compared with 9.2 million in 1958-59. The Pyrethrum Board of Kenya is licensing production of about 23.1 million pounds in the 1960-61 season. This is the highest quantity ever licensed, even exceeding the 16.6 million pounds produced in 1945 under the British Government's wartime guarantee.

•

Brown Joins Simplot Co.

Bernard L. Brown has joined the Minerals and Chemical Division of J. R. Simplot Co., Pocatello, Idaho, as an agronomist. He had been extension soils specialist at Montana State College since April, 1958.

•

Cuba Seizes Armour Plant

The Cuban government last month seized Armour and Co. fertilizer plant at Matanzas, east of Havana. It was the first major expropriation of American property since Cuba filed its complaint with the United Nations July 11 that the United States is waging economic aggression against Cuba.

An official at Armour's Chicago headquarters said that the plant is a relatively small mixing operation and that financial loss potential as a result of the seizure is minor. Armour has operated in Cuba since 1916.

PCA Firms Consolidated

Potash Company of America Ltd., a wholly-owned subsidiary of Potash Company of America, Denver, Colo., has merged with the parent company. With the merger, Potash Company of America has indicated its determination to move forward with the developmen of the Canadian property.

The shaft of the Canadian subsidiary, located near Saskatoon, was bottomed at 3,450 feet in June, 1958. Seepage of water into the shaft, however, made it necessary to suspend operations in the early part of November, 1959. Cementation Co. (Canada) Ltd. currently is proceeding with a program of grouting the entire shaft area so that the operations may be resumed within two years.

•

History Of A Pesticide Told

The Colorado Agricultural Chemicals Association, Denver, has prepared a press release for use by newspapers that describes the development of a new pesticide, from birth through research and production and marketing.

Using the fictional name "Pesto" for the pesticide, the release tells of the painstaking research and experimental work that is involved, together with the cost. It is intended to allay any misapprehensions the public may have as to the harmful effects of pesticides on public health.

•

Velsicol Appoints Overton

Velsicol Chemical Corp., Chicago, has appointed Curtis N. Overton as sales representative for the agricultural chemicals division. Formerly with California Spray-Chemical Corp., Mr. Overton will serve customers in the midwest.

•

Bibbins Heads Ag. Sales

James W. Bibbins has been appointed manager of agricultural sales for the Sohio Chemical Co., Lima, Ohio. He had been branch manager for Northrup, King & Co. and vice-president in charge of sales with Central States Seed Service prior to joining Sohio.

UN Starts Campaign To Boost World Food Production

LAST month the United Nations' Food and Agriculture Organization started a campaign to boost world food production through more intensive use of fertilizers. Although this five-year, 76-nation campaign would seem to present a valuable sales opportunity for U.S. fertilizer producers, their response, so far, has been cautious, according to a report in the July 2 issue of *Chemical Week*.

Quoting Hugh S. Ten Eyck, president of International Ore & Fertilizer Corp, New York, the report states that international trading in fertilizers is fraught with problems and pitfalls. For one thing, Mr. Ten Eyck explains, competition is bound to stiffen, as potential markets get bigger and the returns greater. The result probably will be more cut-throat pricing.

Mr. Ten Eyck further emphasizes that many farmers around the world don't use fertilizer at all, or at least don't use optimum amounts for crop yields. Thus, they need technical aid in using fertilizers properly, one problem the UN will work on.

Another source of worry is stiff competition from Iron Curtain countries. In recent years, however, Communist countries have actually imported more fertilizer materials than they have exported. Red China, for example, now buys some 2 million tons per year from Western European nations.

Some U.S. producers have shown interest, however, in the UN program. International Minerals & Chemical Corp., Skokie, Ill., sent a representative to observe the recent FAO meetings in Rome, Italy, as did Olin Mathieson.

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 8

Are You Sure You Use the Right Solution?

IT PAYS TO BE CERTAIN YOUR NITROGEN SOLUTION FITS YOUR PARTICULAR NEEDS

Listed elsewhere in this issue of ARCADIAN® News is the complete line of ARCADIAN Nitrogen Solutions with data about the chemical composition and physical properties of each solution. This line has been designed to cover the wide range of requirements for producing all grades of mixed fertilizers under all conditions of manufacturing.

Your selection of the ARCADIAN Nitrogen Solution that fits your particular needs can increase the efficiency of your operation, help you to produce better quality fertilizer, and save you money.

Choice can be Simple

Under certain conditions, this selection is easy to make. When only one or two fertilizer production factors are important—such as improving physical condition or cutting costs to meet competition—any one of several ARCADIAN Nitrogen Solutions may be suitable to obtain the desired results.

There are other cases where the choice is simple. For example, you may have been successfully producing pulverized fertilizer by using a certain solution, when it suddenly becomes necessary to obtain better control of moisture in the formula. Here again, you can accomplish this by using any one of several ARCADIAN Solutions.

Choice can be Complicated

Your selection of the right solution becomes complicated when numerous factors assume importance in your production problem. For instance, you may wish to generate more heat in the process of granulation. Added to this may be the desire to use the water in the solution for greater uniformity of water distribution with improved safety of operations. As such factors increase, they reduce your choice of solutions.

You may reach the point where it is advisable to re-evaluate the importance of each factor before making your final selection of the right solution, particularly if costly changes in methods or equipment are contemplated. And it pays to make sure you examine the chemical composition and physical properties of each solution in the ARCADIAN line before making your choice.

Freedom of Choice

The big and diversified line of ARCADIAN Nitrogen Solutions offers you a wide range of opportunities in formulating and manufacturing fertilizers. Specific solutions are designed to meet specific requirements. For

(continued on following page)

Nitrogen Division technical men systematically check and analyze the quality and uniformity of ARCADIAN Nitrogen Solutions.

(continued from preceding page)

example, ARCADIAN URANA® Solution adds desirable urea—along with other forms of nitrogen—while improving the physical condition of the fertilizer.

Some ARCADIAN Solutions provide large amounts of nitrate as well as large amounts of total nitrogen in the formulae—all at low cost. Other ARCADIAN Solutions are used in large quantities for their contribution to granulation, achieved at the lowest possible cost of materials and operating expense.

There is a demand today for fertilizers with a high concentration of plant foods and this demand is being met by using the right ARCADIAN Solution. For instance, when ARCADIAN NITRANA Solution 3 is reacted with 75% phosphoric acid, the resulting product in the formula is 22.4% N and 40.0% P_2O_5 or a total of 62.4% plant food (dry basis).

ARCADIAN Nitrogen Solutions add the amounts and forms of nitrogen you want in your fertilizers, plus including the physical properties that are right for your conditions, such as suitable salting out temperatures and reasonable vapor pressures for care-free operation of your ammoniating equipment the year round.

Ask Nitrogen Division

A Nitrogen Division technical service man will be pleased to help you select ARCADIAN Nitrogen Solutions that fit your particular needs—to increase the efficiency of your operation, help you produce better quality fertilizers, and save you money. Contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y.

BASIC FACTS ABOUT NITROGEN SOLUTIONS

Technical literature, tables and graphs often list the physical properties of ammoniating solutions. Although dependent upon the chemical make-up of ingredients, these physical properties are very important to the proper understanding and handling of ammoniating solutions. Check your knowledge of nitrogen solutions on these basic concepts:

1. DENSITY

The density of a liquid is expressed as the weight per unit volume, for example: pounds per gallon. Tank capacities and liquid flows are commonly measured on a volume basis. Density values are necessary in converting the volume measurements to weights, as in formulation per ton.

Because the density varies with temperature, the temperature must be specified. The density of a given liquid can be determined anywhere along the line from solidification temperature to boiling point. However, density is usually quoted at some temperature close to normal operating temperatures.

2. SPECIFIC GRAVITY

For convenience, ammoniating solutions are often quoted in terms of specific gravity rather than density. The specific gravity of a substance is the ratio of weight of any volume of it to the weight of an equal volume of some other substance taken as a standard. The standard for liquids is water. Therefore, the specific gravity of an ammoniating solution is the ratio of its weight to the weight of an equal volume of water. As in the case of density it is necessary to specify the temperature of the ammoniating solution and the water.

All liquids lighter than water have a specific gravity less than 1,000 and all liquids heavier than water have a specific gravity greater than 1,000. For simplification, 60°F is taken as the common temperature at which to quote both density and specific gravity. Water at 60°F weighs 8.334 pounds per gallon. Therefore the density of any liquid can be calculated from its specific gravity at 60°F by multiplying its specific gravity by 8.334. Conversely, the specific gravity of a liquid can be calculated by dividing its density at 60°F by 8.334.

3. VAPOR PRESSURE

The vapor pressure of a solution is the pressure exerted by a vapor or gas released from the solution exclusive of

any influence of added air. It is measured at the surface of the liquid when a state of equilibrium has been reached between the solution and its vapor. Vapor pressure is a function of temperature, and is usually given in terms of gauge pressure, that is—the pressure exerted by the solution above atmospheric pressure. When the vapor pressure of a solution exceeds that of the confining atmosphere, the liquid boils.

Knowing the vapor pressure exerted by solutions, at normal operating temperatures, is of great importance in any consideration of the ease with which solutions can be handled. For example, if such an ammoniating solution were being handled by use of a pump at atmospheric pressures at a temperature where the solution exerted vapor pressure, enough ammonia would be released in the suction side of the pump to vapor-lock it. However, if enough air pressure to overcome this vapor pressure is applied to the tank that supplies the pump, the ammonia would be confined to the solution and it could be handled quite satisfactorily by pumping.

4. SALTING OUT

If ammoniation solutions become too cold, crystallization occurs. The highest temperature at which salt crystals can begin to form is the salting-out temperature or saturation temperature. At any temperature below this saturation temperature, there is possibility of crystals forming which may clog valves and fittings. There is also the possibility of adverse influence on quality and even the analysis of the product.

Under some conditions, solutions can be cooled below the saturation temperature without immediate formation of crystals. In this super-cooled condition, the solution is sensitive to common influences such as vibration, foreign matter or temperature changes which can bring about heavy precipitation of crystals without warning. Since it is impractical to control these influences, many operators protect themselves by avoiding temperature ranges where this trouble can develop. Salting out is one of the most serious problems in operation and safety and every precaution should be taken to safeguard against this possibility. In recognition of this problem the principal properties of ARCADIAN Solutions include the approximate temperature at which salt crystallization begins. This is the highest temperature at which crystallization occurs.

When you desire information of any type about nitrogen solutions, contact: Nitrogen Division, Allied Chemical.

Materials, Methods and Equipment used in making

LIQUID FERTILIZERS

There is widespread and growing interest in complete liquid fertilizers. Here is some technical information that will interest manufacturers who are now producing liquid fertilizers and others who are considering the idea of going into producing N-P-K in liquid form.

Raw Materials

Complete liquid fertilizers, which consist of various fertilizer compounds reacted together by dissolving them with water, are commonly manufactured by combining 4½ parts by weight of 75% phosphoric acid with one part by weight of ammonia (either anhydrous or aqueous). This results in a near-neutral 1-3-0 base solution, to which additional nitrogen salts, potassium and water are added as required by formula.

Potassium is usually supplied as 62.5% K_2O equivalent, chemical grade muriate of potash. Potassium carbonate may be used, in which case allowance must be made for the alkaline value of the carbonate in neutralizing the phosphoric acid because less free ammonia is required to bring the solution to a definite pH.

Supplementary nitrogen is supplied from nitrogen solutions, urea, or ammonium nitrate. Urea, either as such or contained in one of several solutions, is commonly used because of its concentration and high degree of solubility.

Manufacturing Methods

The first step in the manufacturing of liquid fertilizers is usually the mixing of the phosphoric acid with water. The quantity of water used must be large enough to keep the phosphoric salts in solution when ammonia is introduced into the acid-water mixture.

The next step is the introduction of ammonia into the phosphoric acid-water mixture. If anhydrous ammonia is used, a double reaction takes place. First, the addition of ammonia to water results in a reaction forming ammonium hydroxide, NH_4OH. This reaction is accomplished by the production of heat (heat of solution).

Secondly, the ammonia reacts with the phosphoric acid, forming mono-ammonium phosphate, $NH_4H_2PO_4$, and di-ammonium phosphate, $(NH_4)_2HPO_4$. This reaction also produces heat (heat of reaction). Grades having high phosphorus contents require large quantities of ammonia to neutralize the phosphoric acid, thus producing high heats of reaction. This heat can be partially controlled by adding to the acid an aqueous solution of ammonia, thus avoiding the heat caused by mixing anhydrous ammonia and water.

Various amounts of nitrogen or potash are added to make a desired grade. The addition of such compounds as urea, ammonium nitrate and potassium chloride creates an endothermic reaction; that is, the solution must absorb heat in order to dissolve the added compounds. A rule of thumb which might be used for a crude estimate of temperature decrease involved in making a liquid formulation by the addition of ammonium nitrate, urea or potassium chloride to a neutral solution is that the temperature of the solution will decrease 2.2 degrees F. for each per cent nutrient contributed from potassium chloride or urea and 2.7 degrees F. for each per cent nutrient contributed by adding ammonium nitrate.

To control the salting-out temperature and corrosive effects of the finished products, it has been found advisable to neutralize the phosphoric acid to a point part way between the formation of mono-ammonium phosphate and di-ammonium phosphate. This is so that the total ammonium phosphate present is roughly about ⅓ mono- and ⅔ di-ammonium phosphate. This gives a pH value of around 6.2 to 7.0 depending on how far the neutralization is carried and the particular combination of salts present.

Manufacturing Equipment

Manufacturing processes generally fall into one of three categories:

1. The batch weighing system in which raw materials are progressively charged into the reactor, which is usually mounted directly on a scale beam.
2. The metering system in which liquid raw materials are metered into the reactor and solids weighed.
3. The weigh-holding tank system, in

(continued on following page)

(continued from preceding page)

which liquid materials are pre-measured in holding vessels and dry materials weighed. Many combinations of these three systems are presently in use. Continuous processes are possible with a metering system.

New Developments

Refined wet-process phosphoric acid is gaining wide use in the manufacture of liquid fertilizers, as a result of the development of new methods of holding in solution the precipitates formed by the use of this acid. This represents a significant savings, because of the lower cost of wet-process acid as compared to furnace grade acid.

Experimental work in the field with a concentrated super-phosphoric acid has resulted in higher analyses than were formerly possible with favorable salting-out temperatures.

The recent use of clay suspending agents to overcome salting-out problems attendant with higher analyses also shows some promise in the field.

Ask Nitrogen Division

If you desire additional information on the production of complete liquid fertilizers, get the advice of a Nitrogen Division technical service man. Contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y. Phone: HAnover 2-7300.

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	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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St. Paul 14, Minn., 764 Vandalia St. ..... Midway 5-9141
San Francisco 4, Cal., 235 Montgomery St. Yukon 2-6840

Foxboro Southeastern Office Moves to New Quarters

The Foxboro Co., Foxboro, Mass., has moved its southeastern sales and service headquarters to a newly-constructed building at 3393 Malone Drive, Chamblee, Georgia, a suburb of Atlanta. In addition to housing the company's regional headquarters, the new building provides offices for the staff of the Atlanta branch, plus a complete service and repair shop for the general area.

The regional office coordinates the company's sales and service facilities in ten major southern cities. Seven states are included in Foxboro's southeastern region. Regional manager is E. W. Prendergast.

Carroll Named Plant Manager

Frank M. Carroll, previously superintendent, has been appointed to the newly-created post of plant manager at the Baton Rouge (La.) Works of Allied Chemical Corp.'s General Chemical Division.

•

More Grain Pests Intercepted

Infestations of the khapra beetle have been found on 27 ships entering U.S. ports since May 1, the U.S. Department of Agriculture reported last month. Seaports on both coasts and the St. Lawrence Seaway are among those involved.

Infestations have been discovered 113 times since July 1, 1959, compared with 44 interceptions recorded at ports of entry during the twelve months starting July 1, 1958. Efforts to prevent the further entry of this pest into the U.S. are being intensified and quarantine service has been established at all seaway ports receiving foreign shipping.

•

Spray Gypsy Moth In Quebec

Tree growth on 2,000 acres in southern Quebec was sprayed from the air with DDT last month in a campaign against infestations of the gypsy moth. It is only the third time in 35 years that an outbreak of this pest has been reported in Canada.

L. L. Reed, who directs survey work for the Plant Protection Division, Canada Department of Agriculture, said that DDT in diesel fuel was applied at the rate of one pound per gallon per acre. In addition, precautions are being taken to guard against further spread of infestations. About 800 sex-attractant metal traps, loaned by the United States Department of Agriculture, are being used during the summer flight season of the moth. Last season, 97 moths were trapped in southern Quebec.

•

To Build In Alabama

A fertilizer plant which will have an annual capacity of 50,000 tons will be built on a 250-acre site between Hanceville and Garden City, Ala. Cotton Producers Association, Atlanta, is building the plant, which will concentrate on the manufacture of granular fertilizers.

•

Heads Climax Molybdenum

Wallace Macgregor has been named president of Climax Molybdenum Co., a subsidiary of American Metal Climax, Inc., New York. Mr. Macgregor also was named a v-p. of the parent company.

•

To Manage Sulfur Operations

Ira E. McKeever has been appointed general manager of sulfur operations of Texas Gulf Sulphur Co., New York. Headquartered at Newgulf, Texas, he will have direct charge of sulfur operations at all locations in the Gulf Coast region.

Mr. McKeever joined Texas Gulf in July 1952 and did exploration work along the gulf coasts of Texas, Louisiana and Mexico. Thereafter he served with Texas Latin Exploration Company—a Texas Gulf subsidiary organized to explore in Sicily and other areas abroad. In Palermo, Sicily, he was vice president of this subsidiary from 1956 to 1959. Since returning from Sicily in May of last year, Mr. McKeever has performed company assignments both in the United States and Australia.

New Plants Produce Urea by Pechiney-Grace Process

TWO large urea production plants in the United States were designed and built in recent years by Foster Wheeler Corp., New York for Deere and Company (Pryor, Okla.) and Grace Chemical Company (Woodstock, Tenn). These plants have a urea production capacity of about 180,000 tons per year,—both plants utilize the production process known as Pechiney-Grace.

The outstanding feature of this process is the use of an oil carrier for recycling the unconverted ammonia and carbon dioxide. It is a complete recycling process. A comparison of the Pechiney-Grace urea with urea from other processes indicates that the former urea is as low or lower in biuret content than most competitive grades. Although oil is used as a carrier in the process, the finished product contains no more oil than urea made by other processes, containing just a few parts per million.

In the process, ammonia and carbon dioxide react to form ammonium carbamate. This reaction to carbamate is highly exothermic and the heat energy released supplies the energy for the final reaction: the dehydration of the ammonium carbamate to urea and water. Test runs are reported to have shown no measurable loss of unreacted ammonia.

Multiwall Bags by International Paper

Multiwall bag undergoes drop test at new Camden lab.

Trial by torture

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IMC Group Tours Europe

Fourteen executives of International Minerals & Chemicals Corp., Skokie, Ill., and their wives, are making a 15-day, five-country tour of Western Europe as part of President Eisenhower's People-to-People Program for building friendships abroad.

The tour, Aug. 1 to Aug. 15, takes in England, France, The Netherlands, West Germany, and Italy. Heading the party is IMC marketing vice president Anthony E. Cascino, and E. C. Horne, sales manager of the materials department in the agricultural chemicals division. Other members of the party are: William W. Chadwick, Gerd W. Kraemer, Jack W. Lindsey, William E. Lane, Robert A. Hauerman, Alexander McBride, Harold Hoffman, Basil Surgent, Melvin Kartchner, William Lawhon, James Patrick, and Harry M. Feigin. IMC is the first fertilizer company to send a people-to-people group overseas.

•

CACA Lists Program

The Canadian Agricultural Chemicals Association has released an outline of the program for its eighth annual meeting, to be held at Britannia Hotel, Lake of Bays, Muskoka, Ontario, Sept. 11 to 14.

Among the speakers will be Dr. F. Glen, director general, Research Branch, Canada Department of Agriculture, "Evaluating New Pesticides"; Dr. A. W. A. Brown, department of zoology, Western University, London, Ont., "Insect Resistance"; and George Garrett, vice president, Carbide Chemicals Co., division of Union Carbide Canada, Ltd., "Tariff Reference 120." Also, Louis F. Czufin, California Spray Chemical Co., will discuss advertising and selling. Among other subjects to be covered at the meeting are marketing and publicity.

•

Grace Divisions Renamed

W. R. Grace & Co., New York, has changed the names of two of its eight divisions. Grace Chemical Division's new name is Nitrogen Products Division, while Dewey and Almy Overseas Division has become Overseas Chemical Division.

Nitrogen Products Division operates an ammonia and urea plant in Memphis, Tenn., as its major chemical manufacturing activity. It also has been assigned the management responsibility for Federation Chemicals Ltd. in Trinidad, B.W.I. and Caribe Nitrogen Corp., Puerto Rico.

Sevin OK'd For Earworm

An additional use for Sevin, the control of corn earworm, has just been cleared by the U. S. Department of Agriculture. One important advantage to the use of Sevin to control earworm in corn, according to Union Carbide Corp., manufacturers of the product, is that treated forage still may be fed to dairy cattle and other livestock.

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125 Attend Sixth Cornell Weed Day July 20-21

APPROXIMATELY 125 persons attended the six annual Cornell Weed Day, held July 20 and 21 at Cornell University, Ithaca, N. Y. The first day of the meeting was devoted to field crops, under the direction of Dr. Stanford N. Fertig, and the second day was devoted to vegetable crops, under the direction of Dr. R. D. Sweet. Both directors are members of the Cornell agronomy department.

In a discussion of vegetable crops, Dr. Sweet indicated that granular herbicides will have a place on transplanted vegetable crops if the chemical used is one to which the crop itself has a tolerance. The use of granular herbicides as a post-emergence application may be an added safety factor (from foliage injury) provided that the chemical used is of such a nature that it will not be absorbed by plant roots. It was further pointed out that a fine seedbed is required for optimum results with granular herbicides.

Dr. A. M. S. Pridham of Cornell, in a discussion of nursery crops, said that fall and early spring applications of granular herbicides have a definite place and the best potential appears to be on woody-type plants.

In a forage crops discussion, Dr. Fertig said that granular herbicides will not be recommended for use on corn. This decision is based on trials conducted at Cornell which, it was pointed out, may not be typical of general field usage in many areas of the Northeast. Where corn follows grass sod, the seed bed often is quite rough, an advantage for granules. In one out of three years, however, moisture is not adequate for proper granular usage. In addition, with some granular application equipment on certain soil types, growers experienced difficulties in calibrating row crop applications.

In a group discussion following the formal presentation, it was pointed out that Eastern States Farmers Exchange had experienced excellent field results with granular Atrazine on corn in western Pennsylvania. In Delaware, one grower reported treating 500 acres of lima beans with Dinitro granules with excellent results.

An exhibition of granule applicating equipment featured machines offered by Gandy, Noble, John Deere, and a GLF "special" adaptation of a Gandy tool-bar applicator. In a discussion of granules, it was brought out that, while limited research tests did not appear to give granular herbicides much of a recommendation, grower experience in the field—under commercial conditions—indicates that rather satisfactory results are being achieved.

The use of granular herbicides, of course, is relatively new and the need for more work on the part of the formulators of the chemicals and the manufacturers of application equipment is indicated—especially in regard to ease of calibration in the field and better mountings for some types of planting equipment.

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Calls For Pesticide Facts

Denis Hayley, director of information for the National Agricultural Chemicals Association, Washington, D. C., told the Association of Southern Feed and Fertilizer Control Officials that "Facts, properly and judiciously told to as many (people) as possible, by those in positions of authority, and by those who have frequent contact with influential and respected community leaders throughout the country, will carry a great deal of weight in creating an understanding of the whole question of chemicals in foods."

Mr. Hayley was a speaker at the 18th annual meeting of the association in Gatlinburg, Tenn., June 21.

•

Bemis Personnel Shifts

Several changes in management personnel recently have been made within the western operations of the Bemis Bro. Bag Co. J. D. Richards, former production manager at the Seattle bag plant, now is manager of the Seattle plant and Pacific Northwest sales division located in Vancouver, Wash.

E. G. Muir, head of the sales development section in the St. Louis general offices, moves to Seattle as assistant manager and J. M. Prudhomme, production manager at the Vancouver multiwall plant, has been named manager there. In other moves, F. W. Ayers was named manager of Bemis' Wilmington (Calif.) plant and the Los Angeles sales division, and L. L. Conrad Jr. has been named manager of the company's San Francisco plant and sales division.

•

Chemagro Office Is Moved

The eastern regional sales office of Chemagro Corp., which had been located in New York, has been moved to Richmond, Va. The new address is North Mall, Willow Lawn, Richmond 30.

The Richmond office will be under the direction of Scott James, Howard Elmer, and James Carnes. George W. Hill Jr. remains in New York, where the Chemagro office has been moved to 220 East 42nd St.

•

Smith Heads Armour Division

George C. Smith has been named Montgomery Division manager for the Armour Agricultural Chemical Co., Atlanta. He succeeds R. A. Ellington, who retired last month after 37 years with the division.

Mr. Smith had been sales aide in Armour's Columbus, Ga., division since August 1958. He joined the company in 1948.

•

Niagara Builds Greeley Plant

Niagara Chemical Division of Food Machinery & Chemicals Corp., Middleport, N.Y., has begun construction of a plant in Greeley, Colo. The new plant unit will produce a wide range of Niagara pesticides.

Award To Carpenter

William L. Carpenter, head of the division of agricultural information, School of Agriculture, North Carolina State College, Raleigh, was presented the "Agricultural Communications Award," sponsored by the American Association of Agricultural College Editors and the National Plant Food Institute, at a special luncheon ceremony at Oregon State College, Corvallis, July 18.

•

McLeod Heads CDA Unit

W. S. McLeod, officer in charge of the Canada Department of Agriculture's pesticide testing laboratory in Ottawa for the past eight years, has been appointed supervisor of the pesticides unit, Plant Products Division. He succeeds C. H. Jefferson, who recently was named chief of the division's Feed, Fertilizer, and Pesticide section.

Canada Seen As Major Sulfur Producer By 1962

THE Canadian government's recent approval for large-scale gas export to the United States is expected to lead to the development of dozens of new gas fields in Alberta, particularly in the foothills area. Many of the new fields are sour gas fields and will necessitate the construction of many gas processing plants to remove hydrogen sulfide, most of which will be carried one step further into elemental sulfur form.

It is expected that some 400,000 tons of sulfur will be produced in western Canada this year, all from sour gas fields. This is just about equal to domestic requirements, but most of the demand is in eastern Canada and still is met by lower-priced imports from the United States.

By 1963, however, when the full impact of gas export is felt, total production of sulfur in western Canada is expected to be around 2.5 million tons per year. The disposal of these huge tonnages at anything approaching attractive rates still is a major problem for the gas producers. Factors influencing the market are: competition from other world producers, (U. S., Mexico, and France); the trend in rail and water transportation rates; and the financial ability of the producers to wait for strengthening market conditions before selling.

The primary marketing areas for Alberta sulfur are seen as: the Rocky Mountain and western United States; the Pacific Northwest; and the Great Lakes area. Alberta gas already enjoys a definite freight advantage over sulfur produced in the Gulf Coast and Mexico in the Rocky Mountain area, which currently consumes around 100,000 tons of sulfur annually. Alberta also enjoys a freight advantage in the inner portion of the Pacific Northwest area. Along the west coast, however, Canadian sulfur has to come up against Gulf or Mexican sulfur transported by low ocean freight rates. Canadian railroads, however, are expected to offer lower rates in time as potential volume grows.

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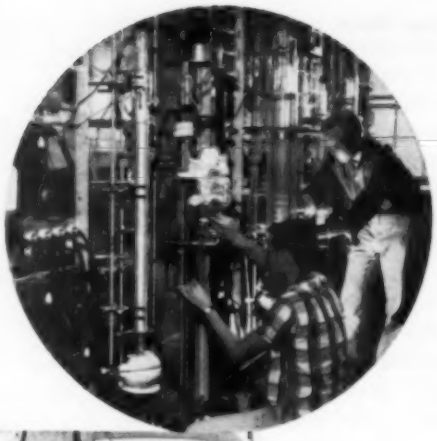

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Red China's Fertilizer Industry Termed Inadequate

THE chemical fertilizer industry of Communist China is getting much less attention than heavy industry in current economic planning. This is surprising, in view of the fact that China's agriculture is the key factor in the company's overall economic plan.

The July issue of *Foreign Agriculture* contains a report on the topic by Hughes H. Spurlock, Far East Analysis Branch, Foreign Agriculture Service. In the report it is pointed out that, after a decade of Communist rule, China's chemical fertilizer industry still is small relative to the need, and plant construction is lagging. Government policy has funneled the bulk of capital investment into heavy industry and power development and the fertilizer industry has had only a small percentage of the money budgeted for economic development.

The question raised by Mr. Spurlock is: Can a weak and technologically backward agriculture meet such huge demands without heavy mineral fertilizer supplements to its traditional organic fertilizer sources — or will the policy lead to a dangerous food and fertilizer crisis?

The Communists evidently have based their fertilizer policy on the assumption that for the first few years of industrialization they can expand agriculture enough through several improved but inexpensive farm practices that use cheap labor and local materials. Then, gradually they hope to bring chemical fertilizers into use in large quantities, as these labor-intensive farm measures near or reach practical limits, and as the country becomes technically and industrially capable of building fertilizer plants using its own resources. Already the Chinese Communists claim a trickle of reverse flow from industry into agriculture, for some fertilizer plants now are being built with parts and equipment made in China.

China's fertilizer production targets and statistics do not show clearly the kinds of materials produced or the contents in percentage of nitrogen, phosphoric acid, and potash. Some useful observations are possible, however. Between 1952 and 1958, both consumption and domestic production of chemical fertilizers increased, but production as a percentage of consumption changed very little. China continued to spend scarce exchange on imports, which by the end of the period had reached 1.5 million metric tons. Chemical fertilizers apparently are being reserved largely for high priority uses, such as increasing the production of cotton and other technical crops in which the government has special interest.

Developments in the fertilizer industry so far suggest a policy of starting with the production of ammonium sulfate, ammonium nitrate, and ordinary superphosphate, and probably moving into the production of urea and the high-analysis metaphosphates as industrial capacity and technology improve. In 1958, reported domestic production included 900,000 tons of nitrogenous fertilizers (probably 20 per cent N), and 344,000 tons of phosphatic fertilizers (probably about 18 per cent P_2O_5). Except for some local areas, Chinese soils are not deficient in potassium; thus, potash production is not being emphasized.

In 1952, China launched its first 5-year plan, which called for an expansion of the country's two existing fertilizer plants and the construction of five additional state-financed projects. By the end of 1958, all five of the new plants were reported to be in various stages of construction and may, by now, be producing at varying levels of capacity.

For the second plan period, however, (1958-62) the state shifted the responsibility for financing and constructing new fertilizer plants to local government units or peasant organizations. This program, if carried to its ultimate conclusion, would have each of some 2,000 counties operating a small fertilizer plant with a capacity of about 8,000 tons. Each administrative region or province would operate intermediate-sized plants with capacities of around 40,000 tons. Transportation, long a difficult problem in China, probably is one reason for the shift to local production.

•

Eastern Branch Meeting

The Eastern Branch of the Entomological Society of America will meet Oct. 27 and 28 at the Hotel New Yorker in New York. A feature of the meeting will be a panel discussion on problems and responsibilities of different agencies with respect to insecticide residues. Charles Palm, dean of the New York State College of Agriculture, Cornell, is scheduled to moderate the panel.

Panel members will be: Justus C. Ward, chief, Pesticides Regulation Branch, USDA; G. E. Lynn, Regulatory Advisory Committee, NACA; Geoffrey Woodard, pharmacologist, Woodard Research Corp., Herndon, Va.; Ordway Starnes, associate director, N. J. Agricultural Experiment Station, Rutgers; and John L. Harvey, deputy commissioner, Food and Drug Administration.

Other features of the preliminary program include an address by Dr. A. L. Taylor, USDA, Beltsville, Md., on nematodes, and a discussion by E. S. Phillips of Cornell on the use of visual aids in scientific presentations.

•

Panogen Name Changed

The name of the Panogen Co. has been changed. The company now is known as Agricultural Division, Morton Chemical Co., Chicago.

The division produces, in addition to Panogen liquid seed treatments, grain fumigants, soil fumigants, soil and turf fungicides, and animal repellents.

Simplot Acquires Plant

J. R. Simplot Co., Pocatello, Idaho, has acquired the entire fertilizer plant facilities of the Anaconda Co. at Anaconda, Montana, and has leased Anaconda's phosphate properties at Conda, Idaho, on a long-term basis.

The Anaconda line of fertilizers continues to be available, and Anaconda is operating the phosphoric acid and ammonium phosphate facilities at Anaconda for Simplot. Marketing is being done by the Simplot Co.

•

To Discuss Pesticides

A symposium on "The Metabolism of Pesticide Chemicals and Food Additives in Animals and Man" is being scheduled for the April 1961 meeting of the American Chemical Society in St. Louis. The symposium is being organized by Dr. R. D. Radeleff, Animal Disease and Parasite Research Branch, Agricultural Research Service, USDA, Kerrville, Texas.

The ACS is asking that 200-word abstracts of contributed papers for the symposium be sent to Dr. Radeleff by Dec. 15.

•

Eastman Realigns Sales

A realignment of the eastern and mid-west regional sales territories has been made by the Chemicals Division of Eastman Chemical Products, Inc., Kingsport, Tenn.

John H. Sanders, former regional sales manager in Cleveland, has been named sales manager for the division. The region formerly supervised by Mr. Sanders, consisting of north-central and southeast portions of the United States, has been divided between the mid-west and eastern regional offices.

•

McCollam Joins AP&CC

M. E. McCollam, recently retired director of the American Potash Institute, has been appointed consulting agronomist by the American Potash & Chemical Corp., Los Angeles.

New Trucks Haul Liquids

The Scherman Trucking Co., with dual operations at Paulding and Lima, Ohio, is equipped with a fleet of new Trailmobile pneumatic tank trailer trucks which it uses to move dry bulk cement. During the spring months of March, April, and May, however, a substantial number of these same trailers are transferred to Lima, where they are converted and put in service moving liquid nitrogen fertilizer from there to farm distribution outlets in 16 states and Canada.

The new trailer's steel shell is made up of two conical sections, joined at the center, which eliminate heavy steel slope-sheets and reduce gross weight of the unit by as much as 22 per cent. Conversion of the tank from a solids to a liquids carrier is accomplished simply by changing dome covers and removing pneumatic mats which are installed along the bottom of the tank's interior.

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Export Department: Chrysler Building, New York 17, N. Y.

General Aniline Accord Seen

After years of legal dispute and negotiations, there now seems to be a chance of solving the long drawn-out battle between the Swiss holding company Interhandel and the U. S. authorities with regard to the confiscated chemical producer General Aniline and Film Corp.

General Aniline seems ready to come to an out-of-court agreement with Interhandel, according to statements made at its recent annual meeting. Even a bad agreement of this kind, it was felt, would be better than a good and promising lawsuit that could stretch out over a further period of years. There is hope that Congress will pass a law enabling the Department of Justice to sell the General Aniline shares, after which the lawsuit could continue should the Swiss concern not be prepared to accept a private settlement.

General Aniline, in which Interhandel claims and interest, was confiscated during World War II as German property under the wartime Property of Enemy Aliens law.

•

U.S.P.P. Expansion Program

The U. S. Phosphoric Products Division of Tennessee Corp., Tampa, Fla., has announced plans for an expansion of its phosphate processing facilities. The new facilities will increase the phosphate products output of the plant by 50 per cent.

Work will begin as soon as design and engineering is complete, and completion of all work is expected by late 1961 or early 1962. The program provides for increased production of triple superphosphate, phosphatic fertilizer solution and Di-MoN.

•

Urea Plant In Portugal

An agreement has been signed between Montecatini and Uniao Fabril do Azoto of Portugal for the construction of a 40,000 metric tons-per-year plant at Labradio, near the town of Barriero on the Tagus River. The plant is being engineered by the M. W. Kellogg Co., New York, and will incorporate the Fauser-Montecatini process of total recycle in the liquid phase.

•

OK Systox On Tomatoes

Systox, a systemic insecticide manufactured by Chemagro Corp., Kansas City, Mo., now is registered by the U. S. Department of Agriculture for control of aphids and mites on tomatoes and peaches, and for aphids on peas and celery.

•

To Expand Facilities

An expansion program that will more than double the Morris Township, N. J., laboratory facilities of Allied Chemical Corp.'s General Chemical Division was started last month.

The laboratory expansion is scheduled to be completed late in 1961.

•

Naugatuck To Build

Naugatuck Chemicals Division of Dominion Rubber Co., Ltd., has completed preliminary engineering and has let contracts for a basic pesticide plant to be located on a site adjacent to Canadian Chemical Co. property in the Edmonton, Alberta area.

The western unit will produce 2,4-D and 2,4,5-T, 2-methyl-4-chlorophenoxyacetic acid, and pentachlorophenol.

Control Officials To Meet

The Association of American Fertilizer Control Officials will hold its annual meeting Oct. 14 at the Mayflower Hotel in Washington, D. C. Among the speakers will be Dr. Charles E. Kellog, USDA, Washington, D. C., "The Role of Fertilizer in a Changing Agriculture"; Dr. Rodger C. Smith, Eastern States Farmers' Exchange, West Springfield, Mass., "Changes in Fertilizer Technology to Meet Agricultural Demands"; and Dr. Ralph L. Wehunt, TVA, Knoxville, Tenn., "The Role of Soil Testing in a Changing Fertilizer and Agricultural Program."

Also scheduled to appear on the program are. Dr. Walter D. Scholl, USDA, Beltsville, Md., "Report on Survey on Bulk Distribution of Fertilizer"; A. H. Mehring, USDA, Beltsville, "Preliminary Report on Non-Farm Use of Fertilizers"; and Dr. William Duncan, U. of Kentucky, "Numerical Characterization of Fertilizer Company Records."

•

Mexican Group To Meet

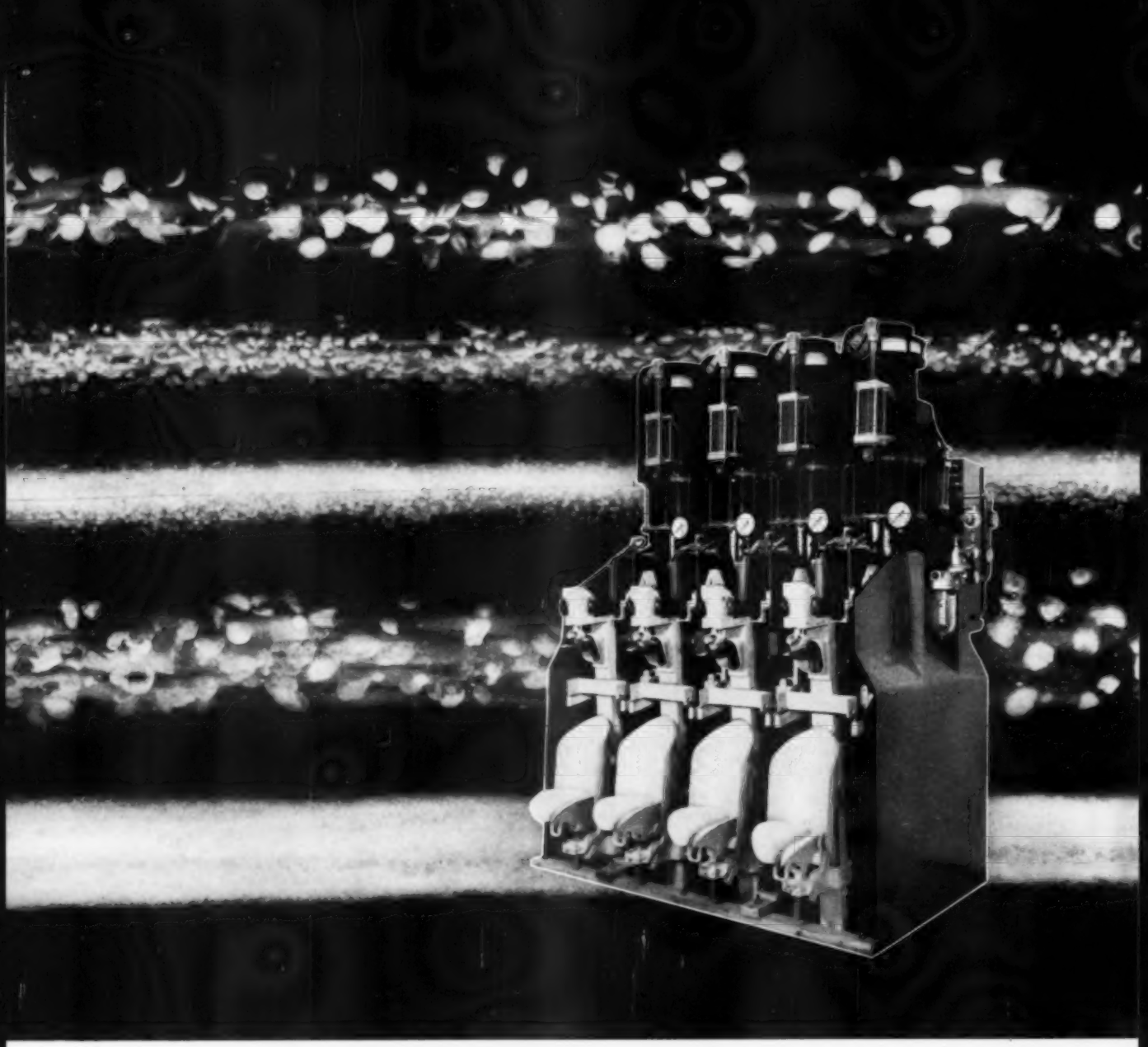
The annual convention of the Mexican Association of Insecticide and Fertilizer Manufacturers will be held in Merica, Yucatan, Nov. 14 to 19.

Pesticide Committee Formed By Academy of Sciences

NATIONAL Academy of Sciences – National Research Council has formed a new committee to "undertake the task of encouraging cooperation and harmonious relations between chemical control of agricultural pests and conservation of wildlife.

The objectives of the committee are to: provide critical evaluation of both the direct and indirect effects of various pest control operations on plants and animals; stimulate new research where gaps exist; foster cooperation among various agencies; and provide technical advice and guidance to bring about maximum control of crop pests with minimum damage to wildlife.

The members of the new committee are: chairman, Dr. Ira L. Baldwin, special assistant to the president of the University of Wisconsin; also Dr. Ira N. Gabrielson, president of the Wildlife Management Institute; Dr. Tom H. Gill, executive director of the Charles Lathrop Pack Forestry Foundation; Dr. George L. McNew, managing director of Boyce Thompson Institute; Dr. E. C. Young, professor of economics and dean of the graduate school, Purdue University; and Dr. G. C. Decker, entomologist, Illinois Natural History Survey. Dr. W. H. Larrimer of the Academy-Research Council will serve as the executive secretary of the Committee.



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For free literature, write Dept. AC-860, St. Regis Paper Co., 150 East 42nd Street, New York 17, N. Y.

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NW Fertilizer Group Discusses Range Fertilization

THE 11th annual Pacific Northwest Regional Fertilizer Conference was held at the Hotel Utah in Salt Lake City, July 13 to 15.

A panel discussion, moderated by William Brissenden, J. R. Simplot Co., Pocatello, Idaho, covered fertilizer effects in mountain meadow and irrigated pasture production. Taking part in the discussion were Rulon Lewis, Soil and Water Research, Conservation Research Branch, ARS, University of Wyoming, Laramie; Weldon Dimond, mountain meadow ranch owner and operator, Cokeville, Wyo.; Robert W. Van Keuren, Washington State University, Prosser; and Wayne Naugle, farm operator, Nampa, Idaho.

During the discussion, Mr. Lewis pointed out that nitrogen fertilization has produced large increases in yield and quality of hay when used with higher-yielding forage species and adequate water control. When considering only hay tonnage, the 80 pound nitrogen applications gave the most economical returns, he said. However, when protein content also was considered, the 160 pound rate of nitrogen was most profitable.

"Without nitrogen, we cannot raise a crop of hay under the conditions of our ranch operation," Mr. Dimond stated. The nitrogen, he continued, not only raises a heavy crop, but causes faster growth. It also stimulates the grass growth to such an extent that weeds become smothered, he added.

Mr. Naugle said that by applying fertilizer in the fall or winter, they have grass at least two weeks earlier in the spring.

Another panel, moderated by Dr. Malcolm McVickar, California Spray-Chemical Corp., discussed the subject, "Shooting for Efficient Production of Non-irrigated Pastures and Rangeland." The importance of grass-legume mixtures was covered by the panel and it was concluded that there is a need to combine the peak production and nitrogen fixing ability of legumes with the wider range of adaptation and seasonal production of grasses to realize the maximum benefits from this combination.

IMC Buys Two Plants

International Minerals & Chemical Corp., Skokie, Ill., has purchased Welcome Agricultural Chemical Co.'s fertilizer plants at Welcome and Marshall, Minn. IMC will continue these operations and will add two premium plant foods, Rainbow and Super Rainbow, to its product line.

R. A. Francher, general manager of the Welcome plant, and Kenneth Verschnetse, general manager of the Marshall plant, will continue with IMC to supervise plant production.

•

AOAC-Wiley Award To Carol

Jonas Carol, deputy director of the Division of Pharmaceutical Chemistry, Food and Drug Administration, has been selected to receive the 1960 Harvey W. Wiley Award of the Association of Official Agricultural Chemists. Mr. Carol has been instrumental in developing methods of analysis for drugs.

•

To Expand Paper Mill

Gilman Paper Co., New York, has announced that a third machine, a 236" width Beloit Paper Machine, for the manufacture of kraft papers, will be installed at St. Marys, Ga.

•

Rogers Joins Sales Staff

Gordon W. Rogers has joined the sales staff of Southwestern Steel Container Co., Dallas, Texas.

•

C-I-L Names A. W. Birnie

Dr. A. W. Birnie has been appointed technical manager of the agricultural chemicals division of Canadian Industries Ltd., Montreal. He replaces K. A. Shantz, who now is the division's production manager.

Dr. Birnie joined C-I-L in 1946 as a research chemist.

EDITORIAL

(*From Page* 27)

agreement in the industry, incidentally, that if farmers could be persuaded to follow the recommendations of their state experiment stations, there would be no problem in doubling fertilizer use over the next five or ten years. The N.P.F.I.'s market expansion program, of course, is designed to get the message across to them that such an expansion in fertilizer usage would put money in their pockets.

As fast as the demand develops, it appears that the plant capacity will be there to satisfy it.★★

Attend International Fertilizer Congress In Italy

A group of U. S. fertilizer executives, and their wives, are shown at the recent International Fertilizer Congress held in Italy. Those pictured include: (foreground) Mrs. C. D. Siverd and Mr. Siverd, general manager of the Agricultural Division, American Cyanamid Co.; and (left to right, starting at center of picture, behind table) Mrs. Fred F. Lucas; Mr. Lucas, director, Virginia Carolina Chemical Co.; Mrs. David N. Hauseman; Mrs. J. L. Potter; and Mr. Hauseman, vice president, Davison Chemical Division. Barely discernible at the left-hand edge of the photo are Alec Deakin, American Cyanamid London office; and William M. Rohrer, assistant sales manager, Agricultural Chemicals, Davison Chemical Division, W. R. Grace & Co.

Hill, Lojewski To New Posts

Dr. Kenneth L. Hill has been appointed head of the herbicide laboratory and Eugene A. Lojewski has been appointed a chemist in the organic synthesis laboratory by Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N.Y.

Dr. Hill had been plant physiologist for the USDA at North Carolina State College. Mr. Lojewski has been with Olin Mathieson and Allied Chemical, prior to joining Niagara.

•

Harke Fills New Position

Cyril J. Harke has been appointed to the new position of production superintendent of the Hooker Chemicals Ltd. chlorine-caustic soda plant at North Vancouver, B.C. He had been technical supervisor at the plant.

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Fertilizer Safety School

A fertilizer safety school will be held Aug. 10 and 11 at the Park Sheraton Hotel in New York under the auspices of the New York State School of Industrial and Labor Relations, with the cooperation of the National Plant Food Institute and the Fertilizer Section of the National Safety Council.

Among the instructors will be: Elmer Perrine, Allied Chemical Corp., "The Handling of Liquid Materials in the Fertilizer Mixing Program;" Ed O. Burroughs Jr., F. S. Royster Guano Co., "Maintaining Good Order for Safety;" and Stratt McCargo, GLF, "School Participation."

•

Calspray Plans Iowa Plant

California Spray-Chemical Corp., Richmond, Calif., has taken an option on 325 acres of land near Ft. Madison, Iowa for the possible erection of a fertilizer plant to serve the midwest.

•

Collins To Manage Sales

Thomas W. Collins, Jr., has been named manager of agricultural chemical sales for Allied Chemical's General Chemical Division. With the division 25 years, Mr. Collins was agricultural chemical production superintendent prior to becoming assistant sales manager in 1951.

•

National Names Biggerstaff

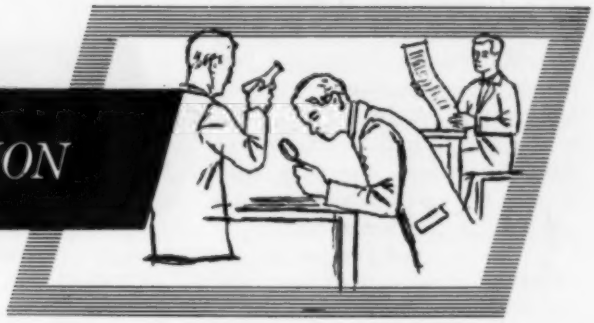
Dever P. Biggerstaff has been appointed plant manager by National Phosphate Corp., Marseilles, Ill. He had been with the Davison Chemical Division of W. R. Grace & Co. as production supervisor of sulfuric acid, phosphoric acid, triple superphosphate, and diammonium phosphate.

•

Heads Technical Service

John L. Frothingham has been appointed manager of technical service, chemical division, Cowles Chemical Co., Cleveland, Ohio. Mr. Frothingham formerly was sales manager of the industrial chemicals division of Pittsburgh Coke and Chemical Co.

TECHNICAL SECTION



Lawn Disease Control

Useful information on the diseases and other disorders of lawns and turf has been brought together in a new circular available without cost from The Connecticut Agricultural Experiment Station. Requests for this 12-page pamphlet by plant pathologists Raymond J. Lukens and Ernest M. Stoddard should be addressed to the Station at Box 1106, New Haven.

The authors point out that good management alone gives effective control of lawn grass diseases in Connecticut. Mismanagement in fertilization, mowing and watering, on the other hand, can set the stage for a good bit of trouble on the greensward.

Lukens and Stoddard give information on cause and control of the seven principal diseases of lawn grass in Connecticut. Brown patch, most prevalent of these diseases on bentgrasses and fescues and sometimes on bluegrass, may be controlled, the scientists have found, by treatment with oxyquinoline sulfate or by the fungicide nabam. These materials are relatively safe for the homeowner to use. The organic and inorganic mercurial compounds used commercially to control brown patch and certain other diseases are highly toxic to man and to pets.

•

Pests In Stored Grain

The report of a survey in North and South America, and certain Mediterranean countries on the "Control of pests in stored agricultural products with special reference to grain," has been published as Project #212 by the European Productivity Agency of the Organization for European Economic Co-Operation.

The European Productivity Agency was set up as a new branch of the OEEC in May, 1953, to stimulate productivity, and thereby raise European standards of living, by influencing not only governments but also industrial, agricultural and research organizations.

The principal result of the survey has been to demonstrate that the main reason for the continuation of infested stored products is ignorance of the effects of infestation by insects and mites.

The report, containing some 170 pages, reviews existing conditions in such countries as: the United States, Canada, Brazil, Argentina, Uruguay, Algeria, Tunisia, Turkey and Greece. Specific chapters of the report are devoted to the technical aspects of control of pests on specific crops; problems connected with ocean transport; the attitude of exporting and importing countries.

Copies of the survey may be obtained at $2.00 from the O.E.E.C. Mission, 1346 Connecticut Ave., N.W., Washington, D.C.

Solan Suggested For Control Of Weeds In Tomatoes

Control of weeds in transplanted tomatoes is one of the difficult problems in growing this crop, since post-emergent or foliar applications of most herbicides have been found highly toxic to tomato plants. Donald H. Moore and Kenneth P. Dorschner, Niagara Chemical Corp., reported* on the use of the new herbicide "Solan" for weed control in tomatoes. The herbicide, N-(3-chloro-4-methylphenyl)-2-methylpentanamide, has been found toxic to a variety of annual broadleaved and grassy weeds, and selective in favor of tomato plants when applied as a foliar spray.

Two experiments were made using the new herbicide, Solan, at three different rates of application, alone or in combination with the insecticide, Thiodan, plus the fungicide, COCS.

In the first experiment a total of three treatments at three different stages of tomato growth were applied. The stages of growth were: (1) 8-12 leaf stage; (2) just after fruit set, and (3) at initial fruit ripening. None of the treatments significantly delayed ripening or reduced total yield.

In the second experiment, Solan alone or in combination with Thiodan plus COCS was used for a total of two treatments at two different stages of growth. The growth stages were: (1) plants in heavy bloom, and (2) plants beginning to produce ripe tomatoes. The results showed a significant reduction in number and weight in the early ripened tomatoes but did not show any significant reduction in the seasonal yield.

Solan at 2.0, 4.0 or 6.0 pounds of active material per acre gave good control of pigweed, lamb's-quarters', ragweed and other broadleaved weeds. Control of the annual grasses was less satisfactory.

*Details of this investigation were presented at the Northeastern Weed Control Conference, held January, 1960 in New York.

Equipment, Supplies, Bulletins

MGK Dairy Spray Bulletin

McLaughlin Gormley King Co., Minneapolis, Minn., has prepared a comprehensive "Dairy Stock Spray Bulletin" that describes the various insect pests of dairy cattle and illustrates, with graphs, the production losses that are the result of biting flies.

Also included are descriptions of MGK Repellents 11 and 326, which usually are combined with synergized pyrethrins in finished sprays. Field tests in which the repellents were involved are covered fully. The bulletin is available from the company at 1715 S. E. Fifth Street, Minneapolis 14.

•

Dorr-Oliver Brochure

A new 12-page brochure, Bulletin No. 8010, describes Dorr-Oliver Inc., Stamford, Conn., as a source of engineering service in the development of complete plants on a world-wide basis.

The services offered include laboratory testing, pilot plant demonstration, plant design and specifications, and erection and construction. Among the specialized fields which are described is chemical fertilizer production. The bulletin, No. 8010, is available from the company.

•

MC Technical Data Sheet

The stabilization of liquid fertilizers is the subject of a technical data sheet recently issued by Minerals & Chemicals Corporation of America, Menlo Park, N.J. The booklet describes the use of ATTAGEL 30, a colloidal grade of Attapulgite, as an agent for the suspension of plant nutrients in water.

•

New B-I-F General Bulletin

B-I-F Industries, Providence, R. I., has published an 8-page general bulletin which provides capsule information about many of the company's products and systems. Butterfly valves, supervisory control systems, totalizing meters, flow meters, process instrumentation, feeders for solids and liquids, and blenders for liquids are among the items covered.

The bulletin, Ref. No. 0001.-20-1, is available from the company at Box 1342, Providence 1.

•

Niagara Thiodan Folder

Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, N. Y., has prepared a folder on the use of Thiodan to control tobacco insects. The pocket-sized folder tells how, why, and when to use Thiodan to control aphids, budworms, hornworms, cabbage looper, flea beetle, and green peach aphid.

Sun Roller-Sprayer

Sun Industry, Inc., Hales Corners, Wisc., is offering a roller-sprayer device that is a self-propelled lawn roller equipped with a pump and six-foot spray boom. The 30 gallon roller drum contains the spraying material and is equipped with baffles inside to provide constant agitation.

Full particulars are available from the company at Box 319, Hales Corners.

•

Dry Processing Catalog

Information on the Sturtevant Mill Co.'s full line of dry processing equipment is contained in the firm's 1960 dry processing equipment catalog, made available last month.

Illustrated with photographs, flowsheets, tables, and graphs, the booklet contains information on Sturtevant's air separators, blenders, mixers, grinders, and other machinery. It is available from the company at 123 Clayton St., Boston 22, Mass.

•

Revised Squibb-Taylor Prices

Squibb-Taylor Inc., Dallas, Texas, has issued a revised price list to go with its anhydrous ammonia equipment catalog.

•

Young Offers Gyro Sifters

The Young Machinery Co., Muncy, Pa., recently acquired the plant and facilities of Robinson Manufacturing Co., also of Muncy, and now is offering a complete line of Robinson Gyro Sifters. The sifters are furnished with single or multiple sieves and can make two, three, or four separations.

A bulletin on the sifters is available from the Robinson Division of Young Machinery in Muncy.

Union-Camp Redesigns Fertilizer Firm's Multiwall Bags

Acting upon recommendations of Union Bag-Camp Paper Corp., New York, Arizona Fertilizer and Chemical Co., Phoenix, recently redesigned its multiwall bags so that they now require less ink coverage. In addition to this redesign, Union-Camp created a new, horizontal design for the company's "Big A" fertilizer bag.

Anti-Coagulant Rodenticide

A new formulation of water soluble, anti-coagulant rodenticide —INCCO 86—is being offered by Inland Chemical Corp., New York.

INCCO 86 is ready to use and no sugar need be added. One-half ounce makes up to a quart of wet bait when mixed with a quart of water. The new formulation prevents separation in solution, eliminates precipitation and residues, and dissolves fast in hard or soft water.

•

FMC Chemicals Catalog

Food Machinery and Chemical Corp., New York, has prepared a catalog of all its chemical products. Entitled "FMC Chemicals," the 36-page, two-color brochure lists FMC chemicals alphabetically, with physical data and uses.

•

To Distribute News Sheet

Nitrogen Division, Allied Chemical Corp., New York, plans to distribute a monthly Arcadian Nitrogen Solutions news sheet to solutions dealers and members of the liquid fertilizer industry. The news sheet will be mailed to dealers and also will be published as an insert in *Solutions* magazine.

•

Respiratory Equipment Table

A gas mask canister selector table, using 62 of the most common industrial gas and vapor hazards is a feature of a new bulletin on respiratory protection equipment being offered by Willson Products Division, Ray-O-Vac Co., Reading, Pa.

Listed opposite each hazard are recommended canister, color guide, and Bureau of Mines approval, where applicable. The bulletin also shows the full line of Willson respiratory equipment. Copies available on request.

•

Continuous Weighing System

A new-type machine for high-precision, continuous weighing of loose, free flowing granular solids is being offered by the Exact Weight Scale Co., Columbus, Ohio.

New Uses For Korlan

Additional registered uses have been announced by the Dow Chemical Co., Midland, Mich., for its Korlan insecticide. Included in the new uses are application as an oil mist spray for control of roaches, as a spray for ants, mosquitoes and silverfish, and control of chinch bugs in lawns in Florida.

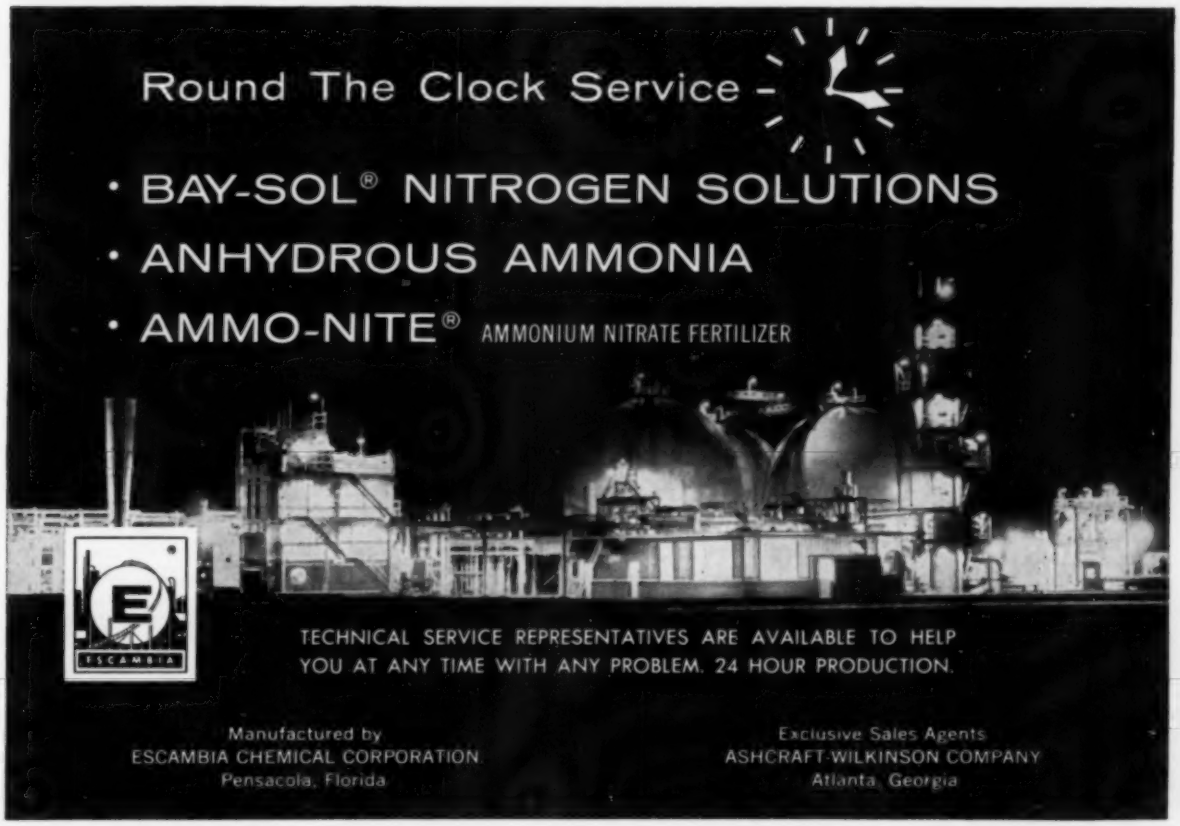
Korlan has been used as a spray, a dip, and a smear for controlling insects in the livestock and poultry industries and for various fly control situations.

•

Two Nopco Emulsifiers

Nopco Chemical Co., Newark, N. J., has begun production of two new emulsifiers, Agrimul N4R and Agrimul N4S, which are designed to be used together in insecticide formulations.

The products are specifically recommended for thiophosphate toxicant concentrates. They are both blends of nonionic and anionic surfactants.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INDUSTRY MEETING CALENDAR

Aug. 7-11 — Rocky Mount Conference of Entomologists, 31st annual meeting, Cameron Pass 4-H Camp (near Gould), Colorado.

Aug. 10-11 — Northeast Regional Fertilizer Safety School, Park Sheraton Hotel, New York.

Aug. 16-17 — Midwest Regional Fertilizer Safety School, National Safety Council Headquarters, Chicago.

Aug. 17-25—XIth International Congress of Entomology, Vienna, Austria.

Aug. 21-25—Canadian Fertilizer Association, 15th annual convention, Manoir Richelieu, Murray Bay.

Aug. 25-27 — Southeast Regional Fertilizer Safety School, Wilmington, N. C.

Aug. 28-31—American Phytopathological Society, 52nd Annual Meeting, American Baptist Assembly, Green Lake, Wisconsin.

Aug. 28-31 — Soil Convervation Society of America, 15th annual meeting, Ontario Agricultural College, Guelph, Ontario.

Aug. 30-31—Herbicides in Forestry Symposium, Pennsylvania State University, University Park, Pa.

Sept. 11-14—Canadian Agricultural Chemicals Association, Britannia Lodge, Muskoka, Ontario, Canada.

Sept. 11-15—138th National Meeting of American Chemical Society, With Chemical Exposition, Statler Hilton Hotel, New York.

Sept. 12-14—Entomology Society of Canada, 10th Annual Meeting with Entomology Society of Saskatchewan, Saskatoon, Saskatchewan.

Sept. 24-26 — Western Agricultural Chemicals Association, 31st Annual Meeting, Palm Springs Riviera Hotel, Palm Springs, Calif.

Sept. 27-29 — National Agricultural Chemicals Association, Annual Meeting, Del Coronado Hotel, Coronado, Calif.

Sept. 29-30 — Northeast Fertilizer Conf., Hotel Hershey, Hershey, Pa.

Oct. 5-6—Southeast Fertilizer Conf., Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 10-11 — Four-State Aerial Applicators Conf., Hotel Chinook, Yakima, Wash.

Oct. 17-18—Fertilizer Section, National Safety Congress, Chicago.

Oct. 27-28 — Eastern Branch Entomological Society of America annual meeting, Hotel New Yorker, N. Y.

Nov. 3-4—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 3-4 — Pacific Northwest Plant Food Assn., Annual Convention, Boise, Idaho.

Nov. 13-15 — California Fertilizer Assn., del Coronado Hotel, Coronado, Calif.

Nov. 14-19—Mexican Association of Insecticide and Fertilizer Manufacturers, annual convention, Merida, Yucatan, Mexico.

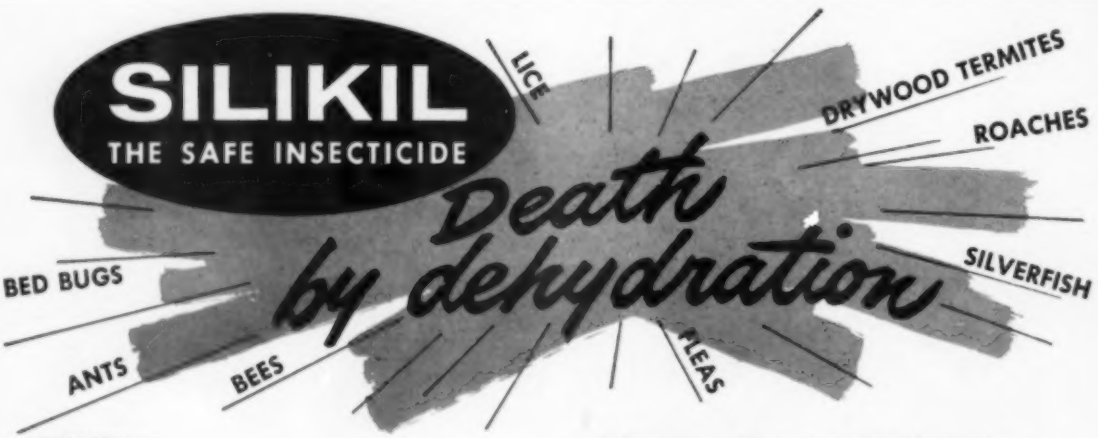
Nov. 28-30 — Soil & Crop Science Society of Florida, Annual Meeting, Fort Harrison Hotel, Clearwater, Fla.

Nov. 28-Dec. 1—Entomological Society of America, 9th Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J.

Dec. 5-7—Carolinas-Virginia Pesticide Formulators Assn. annual meeting, Carolina Hotel, Pinehurst, N. C.

Dec. 5-9—American Society of Agronomy, Annual Meeting, Morrison Hotel, Chicago.

Dec. 12-14 — North Central Weed Control Conference, Hotel Schroeder, Milwaukee, Wis.



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FERTILIZER ECONOMICS

(*From Page* 29)

tively in the interest of a better agriculture in our State. Based on the state tonnage by grades reports of the past two years, we have an indication of the annual waste through inert filler and the loss of potential earning power of our farmers, had this money been invested wisely in plant food. These are so called general crop grades with 100% water soluble nitrogen and potash derived from muriate of potash, neutralized with dolomitic limestone to "Non Acid Forming—Neutral." The approximate filler indicated is wholly inert material unless, of course, the goods should be made highly alkaline, which is not desirable in many instances:

There are other relatively low grades in our present list which would make this waste through cost of unnecessary inert material one million dollars or more annually. Therefore, the total potential loss of earning power of this money wasted for inert filler approximates 3 to 5 million dollars or more annually. Can we afford this unnecessary waste and loss of potential earnings in our agricultural economy in South Carolina?

I would not have you get an erroneous impression of my views concerning agriculture. I fully realize that the end objective of farming is production of good yields and quality of products and a satisfactory profit. I know that while the farmer is naturally concerned with costs, he must not lose sight of this very necessary factor of production. He must not be blinded by a nickel and unable to see a potential dollar. Nevertheless, all of us must consider our costs and put our money in those things necessary to gain our objectives, and this requires that we exclude wasteful practices. The farmer is no exception.

We have a good fertilizer law in South Carolina; it provides the means for keeping fertilizer ratios and grades within proper limits and in step with the advancing technology of agriculture and of chemicals which go into fertilizers. At least it provides the means if we, the people, are adequately informed of this advancing technology, and will support the Clemson Board which is the designated authority for administering the law. My view is that if we are to be properly successful in our agriculture and our fertilizer business in South Carolina, we must be adequately informed and support the proper administration of this law. My plea is that we join together and do this for the benefit of all of our people.★★

NATA SURVEY

(*From Page* 55)

to 20 per cent of their total volume of business.

The education level of the operators is quite respectable. Twelve per cent have a grade school education, 50 per cent have a high school education, and 35 per cent have a college education, or at least part of it. Two per cent of the operators pointed out that they had a post-graduate education beyond college.

The youngest operator in terms of service in the field had been operating only two years. Another operator reported that he had been in business for 37 years. The average, however, ranged from 12 to 13 years for all operators reporting.

The operators reported that they spent 60 per cent of their time in actual application, 15 per cent of their time in ferrying between loads, 15 per cent of their time in going to and from work, and about 10 per cent of their time in loading.

Ten per cent of the operators indicated that they employed a part- or full-time entomologist, but only 4 per cent indicated that they employed a weed specialist. Most of the operators evidently use the services of the state agricultural colleges and experiment stations.

The average number of planes per operator was 3.24. Extending this average ownership to the total number of operators in 1958 would place approximately 6,000 agricultural airplanes in operation in the continental United States. The number of hours for each airplane varied from a low of around 50 to as high as 416 hours per year. The average, however, lay between 250 and 300 hours per year.★

CLOSER CONTROL

(*From Page* 31)

equipment manufacturer has not been in on these studies. We have assumed also that the chemical analysis of a fertilizer material as such, and the analysis of that same material when it becomes a component of a granulated fertilizer, follow the same procedure. Are we right? This assumption should be further investigated.

To supplement the Institute's Chemical Control Project, we also

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sponsor annual conferences on chemical control problems, held at the same time, usually in the fall, as the AOAC meetings in Washington, D. C. These conferences serve as a forum for both industry and state chemists to pose their problems, exchange ideas and arrive at solutions. The conference has stimulated interest among chemists and has justified the effort and time involved. In passing, I should like to say that, although it is not sponsored by the National Plant Food Institute, we support and assist the efforts of the Fertilizer Industry Round Table which performs a useful function in disseminating new developments in technology among industry and government workers.

As an additional supplement to our main research project in chemical control, the Institute is sponsoring the preparation of a manual on standardized methods of chemical analysis for the fertilizer industry. This manual will contain official AOAC methods, but written in greater detail than the style of the AOAC official methods. It is recognized that the official methods had to be prepared in condensed form to occupy limited space in the book of methods. The assumption of the editors was that these methods would be interpreted by experienced analysts. Today's laboratories contain a large number of technicians. Our surveys have shown that there is considerable variation in the interpretation of the official methods among all laboratories. This is one of the strong reasons that led to the decision to prepare the manual.

There is more to the Institute's Chemical Control Project than procuring a satisfactory and fair procedure for sampling and analyzing fertilizer. I am confident that I have the best interests of you and ourselves at heart when I say that the fertilizer industry has the obligation to protect its own good name. In reality, you, too, have a tremendous stake in seeing that we find, promulgate, and use the most efficient methods available in control work for the fertilizer industry, thus winning for yourselves commendation for a difficult job well done. Having known many commissioners, secretaries, and directors of agriculture, I know they, too, are zealous in their desires to render a service commensurate with the needs of agriculture. I know, also, that they employ competent state chemists, each one anxious to guard his professional standing and to be distinguished by his works.

We all agree that, from the consumer's viewpoint, the ultimate purity of fertilizers is not comparable to that required for drugs or food. We must be reasonable in establishing tolerance levels in the analysis of fertilizers. Unrealistic tolerances that require a much higher degree of accuracy in chemical formulation than may be necessary cost money. We all know that in the long run the customer pays the difference. We do need realistic tolerances and uniform standards and I believe all the industry is anxious to assist the control officials in their efforts to improve sampling and analysis techniques. Industry members are anxious to have a system that quickly and fairly differentiates between honest and somewhat dishonest or sloppy practices. In other words, the honest manufacturer wants protection from dishonest competition. Here you can play the leading role, because the fertilizer law should be concerned primarily with establishing standards that the manufacturer can attain. In this important area of achieving realistic, workable, and practical chemical control procedures in the fertilizer industry, you hold the key to potential success. After all is said and done, the "true" analysis of any grade of commercial fertilizer is the officially reported analysis of the state chemist. That's what the law recognizes, and that is why we in the fertilizer industry are concerned with improving chemical control procedures.★★

PRODUCTION ROUNDTABLE

(*From Page* 46)

tion, a further revision will be made. Formula 6, Table 1, shows a triple superphosphate content of 224 pounds with 53 pounds of ammonia. Formula 7 shows 182 pounds of triple superphosphate with 55 pounds of ammonia. Since 205 is about halfway between 182 and 224, the figure 54 for ammonia, halfway between 53 and 55, should be used. This means that 1 additional pound of ammonia, converted into ammonium sulfate (see Table 4), will increase the ammonium sulfate by 3.88 pounds or 4 pounds for the nearest whole number. The formula weight will also be increased by 4–1 = 3 pounds; thus, triple superphosphate must be increased by 2 pounds and normal superphosphate decreased by 5 pounds, as shown in Revision No. 4.

After becoming accustomed to using this system of formulation, reliable shortcuts will become obvious, some of which are illustrated in the next example.

Assume that the production manager decides the plant does not have sufficient capacity to dry the product and produce at a rate necessary to meet production schedule using 414 (19-74-0). From the chart, Figure 2, he decides that 471 (30-64-0) comes nearer meeting the need.

Deriving all the nitrogen from 471 (30-64-0) puts 326 pounds of ammonium nitrate into a ton of product. Formula 5, Table 1, has 275 pounds of ammonium nitrate. The difference in 326 and 275 is 51 pounds of ammonium nitrate to be added. In adding 51 pounds of ammonium nitrate, 86 pounds of ammonium sulfate must be subtracted to hold the nitrogen constant (Table 2). The change in formula weight is minus 35 pounds. The finished product will contain 35 pounds of moisture, so the bone dry formula will contain 1,965 pounds of material. In this instance, the change in formula weight brought about by the adjustment of ammonium nitrate exactly equals the formula weight change brought about by moisture adjustment, so that only one revision is necessary.

	5	Revision No. 1		Actual Raw Materials
Ammonia	51	51	471 (30-64-0)	510
Ammonium Nitrate	275+51	326		
Ammonium Sulfate	491–86	405	66° Be′ Sulfuric Acid	316
Triple Superphosphate	266	266		280
Normal Superphosphate	517	517		558
Muriate of Potash	400	400		400
	2,000	1,965		2,064

Actually, formula 6 containing 344 pounds of ammonium nitrate, is much closer to the 326 pounds of ammonium nitrate needed. Formula 5 was selected because it was seen that with a 35 pound moisture adjustment, it would be better to select formula 5 so that the ammonium nitrate would have to be increased, which automatically decreased formula weight. It just happened to exactly offset the moisture adjustment, but that is the sort of thing that saves time as one becomes familiar with the system.

One more example should further help to clarify the use and help to emphasize the value of this system.

The manager of a plant that does not preneutralize knows that adding 316 pounds of 66 degree Be′ sulfuric acid is out of the question, unless it is done step-wise. Perhaps experience has taught that obtaining 9 units of nitrogen from 471 (30-64-0) meets the needs of the plant. To derive 9 units of nitrogen, 382 pounds of 471 (30-64-0) are required:

382 x .30 = 115 pounds of ammonia added

382 x .64 = 244 pounds of ammonium nitrate added

When only 244 pounds of ammonium nitrate are in a ton of product, 2.6 per cent moisture can be tolerated. The bone dry formula should total 1,948 pounds.

By adjusting formula 4, it is necessary to add 38 pounds of ammonium nitrate to the 206 to get 244 pounds. Table 2 indicates that 64 pounds of ammonium sulfate must be subtracted, a difference of 26 pounds. Since the moisture requirement calls for a reduction in formula weight by 52 pounds: 52–26=26 pounds, the formula weight must be further reduced. To do this, Table 3 shows that 21 pounds of triple superphosphate would reduce the ammonia shown, as such, by 1 pound, and 4 pounds of ammonium sulfate is formed which causes a further change in formula weight of 3 pounds, making a total of 29 pounds.

From Table 3, changing the formula weight 29 pounds requires the addition of 23 pounds of triple superphosphate and the subtraction of 52 pounds of normal superphosphate. All changes can be made in one revision of formula 4.

	4	Revision No. 1		Actual Raw Materials
Ammonia	50–1	49	471 (30-64-0)	382
Ammonium Nitrate	206+38	244	66° Be′ Sulfuric Acid	205
Ammonium Sulfate	614–64+4	554		296
Triple Superphosphate	308+23	331		349
Normal Superphosphate	422–52	370		398
Muriate of Potash	400	400		400
	2,000	1,948		2,030

As shown above, 382 pounds of 471 (30-64-0) introduces 115 pounds of ammonia of which the combined phosphates react with 49 pounds, That leaves 66 pounds of ammonia to be netralized with 66 degree Be' sulfuric acid. Table 4 shows that 204.6 pounds of sulfuric acid are required. The table also shows that 256.08 pounds of ammonium sulfate are formed. 554—258=296 pounds of ammonium sulfate to be added as a dry material; thus, the actual raw materials are determined.★

PEST ROUNDUP

(*From Page* 57)

years. In areas of New York, Indiana, and Ohio, the insect was causing damage in untreated orchards.

The oriental fruit moth caused terminal damage in untreated orchards of Orleans County, New York. By early June, in Missouri, damage by the insect still was evident though the peak of infestation had passed. Heavy infestations were reported on peach from the Woodville area of Tulare County, California.

European red mites were building up generally by the latter part of June in Maine. In untreated orchards, populations were on the increase in central Ohio and in the Vincennes, Indiana, area. *Tetranychus* spp. were building in localized areas of Delaware and Illinois.

The pecan nut casebearer was reported as damaging in the Carlsbad, New Mexico, area and in Sterling County, Texas, where insecticides were applied in the commercial pecan growing areas. Heavy infestations were noted in the Lake Charles, Louisiana, area and 12 percent larval and 20 percent egg infestations were recorded in nut clusters checked on native pecan trees in Jefferson County, Oklahoma.

The bollworm was, perhaps, the most important cotton insect during the latter part of June. In the Coastal Plains counties of South Carolina, the insects were becoming a major problem. Four percent of the squares were recorded as being damage in Orangeburg County. Egg deposition was high in Georgia, Alabama, Mississippi, and Louisiana. Activity was on the increase in many areas of Texas.

Although boll weevil activity generally was light throughout its range, some increase was noted by late June. This was particularly true in areas of North Carolina where infestations in early, untreated fields ranged up to 75 percent. Infestation counts in some untreated fields of South Carolina reached 55 percent, while infestations were low, but on the increase, in Tennessee, Arkansas, Mississippi, Louisiana, Oklahoma, and Texas.

Thrips were heavy on cotton in areas of Texas, Mississippi, and Tennessee.

The face fly continued to spread and be a problem on livestock. States reporting the insect for the first time in June were Connecticut and Tennessee. In western and southwestern Virginia, the pest was causing concern to beef cattle raisers. Heavy numbers were reported on dairy cattle in Howard County, Maryland, and the insect drove cattle to the shade in Perry and Muskingum Counties, Ohio.★★

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MITE CONTROL

(*From Page* 51)

were guaranteed of one advantage by air, however. We were not going to have run-off, and run-off wastes a lot of toxicant in ground applications. Hercules told us Delnav had never been used before by air on citrus and they had no recommendations on effectiveness, but they were quite willing to cooperate with us in doing some test work to find out how Delnav performed.

We decided to use a helicopter in our tests. A helicopter is relatively expensive as air equipment goes, but offsetting this was the advantage of operating out of the grove in which we were running the tests. Its ability to hover, permitted us to apply Delnav in whatever pattern we decided on to give us the answers we were looking for, and its rate of speed allowed us to obtain as much or as little coverage as we desired on a single pass. Since we had no idea what constituted good coverage by air, we assumed it might require a lot of adjustment to give us the results we wanted.

Our first test was arranged in the fall of 1958, and the applications were made in January, 1959. We used a half-dozen assorted five-acre blocks of citrus and tried to find out three things from them. We tried to determine what gallonage to use to give us the best coverage at the lowest cost. We tried to see how much Delnav would be required to give us good mite control, and we tried to determine how many applications of Delnav it would take to give us the same mite control we were obtaining with one washdown application by ground equipment. It was obvious if Delnav's control was not too good by air, it would cost us more in insect-damaged, low quality fruit, than it would save us in application costs. It was also obvious that if more than two applications were required, it might

be better to stick with our old ground equipment program.

By post bloom in March, we had none of the answers we were looking for. Delnav, at all dosages and gallonages, and with only one application was controlling mites that had begun appearing in nearby untreated groves. By mid-April, Delnav still was controlling the mites, and it was not until mid-May that we had the solutions to our first two questions. By May, we were experiencing infestations of rust mites in all of the five-gallon-per-acre treatments. But the mites were appearing only in the five-gallon treatments. No matter how much or how little Delnav we had used, there were no mites in the ten-gallon blocks. Apparently coverage was the big factor in aerial, as well as ground, effectiveness. All dosages of Delnav were free from mites in the ten-gallon-per-acre blocks, and they all showed mites in the five-gallon blocks, although in varying degrees. This occurred in spite of the five- and ten-gallon blocks being adjacent to one another in all cases.

Since purple mites are not a commercial problem in the summer, we abandoned our test work on length of control, until the fall of 1959, to take full advantage of Delnav's combined rust and purple mite control. At that time, we treated some four hundred acres with Delnav in several groves at a dosage of a quart of 4 lb./gal. Delnav per acre, and found that no more than two applications were ever required to last us from fall until post bloom, and we could usually expect to get by with one application, depending on how early in the fall we had to apply Delnav.

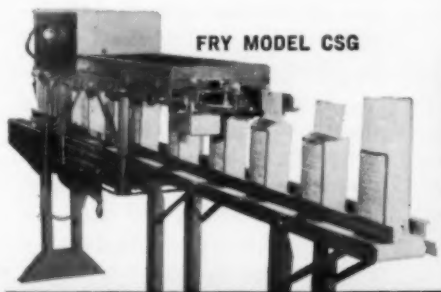
We ran a lot of other tests with helicopters to determine the full value of aerial application for mite control, and we have come up with the following ideas from our work with Delnav.

First, and most important, we have found that, contrary to common belief, helicopter application *can* be counted on to give good mite control. One application, put on a grove at the time we would normally apply a ground spray, usually will last just as long. In a few groves where a second application is required (because a less active ingredient is used), the grower still is ahead costwise because he used the helicopter.

We found that Delnav will give as complete an initial kill of purple mites by helicopter as it does by ground equipment, even on extremely heavy populations. There may be a day or two delayed action in spots on the trees where the spray has missed, but purple mites are active and will move quickly onto the Delnav residues on adjacent leaves and twigs and be killed. Coverage appears more important with rust mites since these mites are slow to move about. Complete control of a heavy population of rust mites can take time, and even a second application may be required with Delnav to give a really good initial clean up. Once the rust mites have been knocked down, however, we have found Delnav will last as long by air as it will by ground. In some cases, we think it may even last a little longer. This longer control may result from the heavier initial residue from the Delnav, since there is no run-off with helicopter applications.

In summary, I might say that when we applied Delnav by helicopter to low populations of mites, in line with the best recommendations for ground sprays, we had no trouble controlling either rust or purple mites with one application from fall or winter until post bloom.

We believe helicopter application has proved itself a very effective tool in citrus mite control, and we are now looking for more cost savings from this method. Recently we have been experiencing some excellent scale control from heli-



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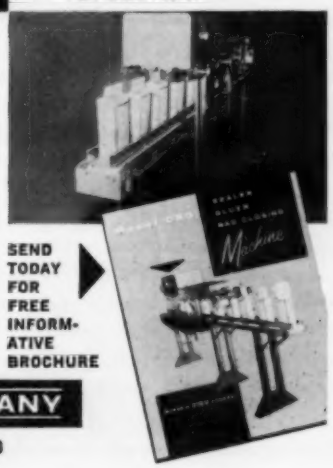

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LISTENING POST

(*From Page* 61)

pint; and dodine (65%), 1.5, 1, and 0.5 pounds.

Statistical interpretation of results showed that comparable control of powdery mildew was achieved with the 25% crotonate, micronized wettable sulfur at the two higher rates, the liquid crotonate, dodine at the highest rate, and the 25% crotonate-dodine combination. Keil and Wilson emphasized the results from sulfur, which, they stated, were especially significant because temperatures of 90° F. or over, conducive to sulfur burn, prevailed for two weeks during the spray period. Also noteworthy was the effectiveness of the low rate of the 25% crotonate in combination with dodine; control obtained from 0.25 pound in the mixture equalled that from 0.5 pound of the 25% crotonate alone. Moreover, the combination provided excellent scab control.

At the highest dosage, dodine caused objectionable lenticel injury.

Keil and Wilson concluded that it should be possible to obtain satisfactory control of powdery mildew by including low, safe dosages of sulfur in apple spray schedules.

The prevalence of scab and late-summer diseases in the orchard afforded an opportunity to evaluate the test chemicals for control of these diseases. Dodine was outstandingly effective against scab. Control of sooty blotch (*Gloeodes pomigena*) and fly speck (*Leptothyrium pomi*) was not very good with any chemical, but dodine, again, was significantly better than the other materials.

Onion Smut Control

A. G. Newhall and J. L. Brann (3), of Cornell University, Ithaca, N.Y., investigated the feasibility of using granules for application of thiram (tetramethylthiuram disulfide) and other materials to control onion smut (*Urocystis cepulae*). According to Newhall and Brann, Attaclay granules containing an insecticide are being used to control onion maggot. Since no inexpensive solvent is available for thiram, the material cannot be used to impregnate the granules. Mechanical mixtures of granules and thiram, however, have been shown to be effective. Simultaneous application of an insecticide and a smut-control-chemical would be advantageous.

Newhall and Brann devoted preliminary greenhouse trials to determining the most effective concentration of dry thiram for mixture with granules, and the most effective rate of application of granules for smut control. They reported no difference between the lowest concentration tried (4 percent by weight), and the highest (10 percent). Also, the lowest rate of application (23 pounds per acre) gave almost as good smut control as the two higher rates (46 and 69 pounds).

In field trials in 1959, several formulations of thiram were compared with captan 50 (*N*-(trichloromethylthio) - 4 - cyclohexene-1,2-dicarboximide) and 50 percent *N* - trichloromethylthiophthalimide (TMTP). (Some other materials included in the trials are omitted here.) The powdered fungicides were thoroughly mixed with Attaclay granules impregnated with an insecticide. A slurry preparation of thiram was sprayed on the granules.

All the granular materials provided similar and satisfactory control of smut. Results showed that with a preparation containing 50 or 75 percent active ingredient there was no advantage from a concentration higher than 4 percent by weight. Newhall and Brann concluded that, according to their tests, 25 or 30 pounds per acre of granules carrying not more than 4 percent by weight of 50 percent thiram, captan, or TMTP, should be sufficient for satisfactory smut control.★★

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(1) Cole, John R. 1960. Dodine, an outstanding fungicide for pecan scab control. Plant Disease Reporter 44: 251-252. April.

(2) Keil, Harry L., and Roy A. Wilson. 1960. Evaluation of fungicides for control of powdery mildew, as well as other diseases, of apple. Plant Disease Reporter 44: 253-255. April.

(3) Newhall, A. G., and J. L. Brann. 1960. Onion smut control experiments with granule formulations in greenhouse and field. Plant Reporter 44: 269-272. April.

RESIDUES

(*From Page* 41)

ducing properties—without speaking of dosage. And dosage implies not only amount but time—how much over how long a period. Thus the level at which a chemical residue becomes toxic is the significant factor that must be taken into consideration in determining the safety of a given chemical.

This, I am convinced, is the key to a workable definition of *zero* as it applies to residue tolerances. Methods of analysis are continually being improved, and "zero" depends on the sensitivity and accuracy of the method used. In other words, a chemical may be tested today and declared acceptable on the basis of "no residue." But tomorrow, a more sensitive test may be found which reveals a residue. Obviously, this creates a confusing

situation for manufacturers, State and Federal enforcement officials, and users of chemicals, as well as the general public. There must be a level of significance established, and the determination as to what is significant and what is not, must be based on the best professional and scientific judgment available.

I feel certain—as we move ahead in research and education—that many of the chemicals now being questioned will be given a clean bill of health for many uses. In the meantime, we in Government and industry must search for chemicals that can be formulated into effective pesticides that offer a wider margin of safety to warm-blooded animals than those in use. We must also intensify our search for biological controls for use in sensitive areas.

The development of more effective pest-control methods—whether they involve chemical or biological means or a combination approach—calls for more intensive research on the pests themselves. The more we learn about the insect, weed, or disease we are trying to control, the easier it will be to develop chemicals and attractants, natural enemies, or other methods that will control the pest without danger to wildlife, crops, animals, or man.

As our standards of living continue to rise—as research reveals new knowledge about the relationships of pests to disease and health . . . as industry provides us with the means for greater comfort and well-being . . . we will demand greater freedom from pests of all kinds. Consumers demand high quality farm products, free from pest damage and contamination. Farmers, processors, and marketers are constantly searching for the tools to furnish these higher quality, pest-free products. People everywhere are looking for freedom from the nuisance, discomfort, and hazards to health that are associated with insects and other pests.

In closing, I want to emphasize that it is agriculture's responsibility to see that the people of this country derive maximum benefit from agricultural chemicals. To do this, of course, they must be used safely. Chemicals are an essential production tool. If we are to continue providing the food that we need, in the variety and quality we want, we have no present alternative to the use of chemicals. We have the competence in this country to use them to great advantage without harm to anyone.★★

BEETLE CONTROL

(*From Page 37*)

The residue from foliage applications of some chlorinated hydrocarbon insecticides applied to crops for the control of other insect pests over a period of several years becomes sufficient in the soil to give economic control of the white-fringed beetle. In tests where 58 pounds of toxaphene or 6 pounds of dieldrin per acre were applied over a 5-year period, good control of the white-fringed beetle was obtained for 4 years after treatments were stopped.

Another problem in the Federal-State program has been a treatment for materials which carry white-fringed beetle eggs. Many chemicals were tested as ovicides from 1939 through 1953. The first effective ovicide developed was dinitrocyclo hexylphenol. This chemical, used at the rate of 1 pound in 7½ gallons of kerosene, gave complete mortality of eggs; however, owing to its yellow color, it could not be used on all materials requiring treatment. One pound of technical DDT in 7½ gallons of kerosene also proved to be an effective ovicide, but since it had an oil base its use was also limited. Another effective ovicide developed was 1 pound of gamma isomer of benzene hexachloride in 100 gallons of water. This material with a water base can be used on a wider variety of objects than can one with an oil base. In using any of these materials as ovicides it is necessary to wet the egg masses thoroughly.★★

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APPLYING AEROSOLS

(From Page 53)

per cent deposition of the aerosol at different velocities may be obtained from Table 2. These values were computed for an aerosol cloud released at an average height of 10 feet, and under good inversion conditions. If penetration of dense foliage is required, the particle size indicated should be reduced by one-half.

Sometimes the dosage depends on the deposit per acre of insecticide required to control the insect. It is measured by the amount applied per 100 feet of front, and varies with the swath width. Values are based on the premise that 25 per cent of the insecticide deposits in the first swath. Application to successive swaths results in overdrift, which increases the deposit by 10 to 20 per cent in each swath. In a large field, therefore, the wast-

Table 1. Effect of particle size on the per cent of total insecticide depositing on 100-foot strips across a field.

Distance from release front (feet)	Mass median diameter of particles 75 microns	40 microns	25 microns
0-100	25.8	7.6	1.4
100-200	16.6	7.5	1.4
200-300	11.1	6.5	1.4
300-400	5.5	4.7	1.4
400-500	2.8	2.8	1.4
500-600	1.4	1.8	1.4
600-700	.9	1.7	1.4
700-800	.5	1.7	1.0
800-900	.5	1.7	.7

Table 2. Optimum particle size, in microns mass median diameter, of aerosols applied at different swath widths and wind velocities.

Swath width (feet)	Wind velocity in miles per hour 1	3	5	7[1]
50	55	98	—	—
100	40	70	92	—
200	29	50	65	77
250	26	45	60	70
300	24	40	53	63
400	21	35	46	55
500	18	33	41	49

[1]Application at higher wind velocity is not recommended.

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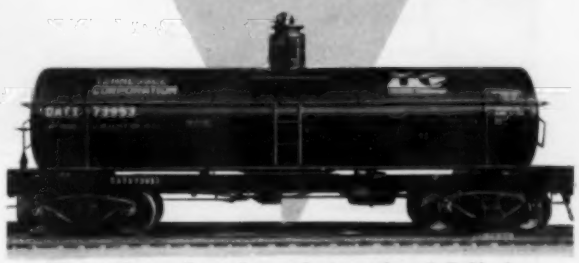

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age due to overdrift is reduced to that from the last few swaths. For swaths less than 300 feet wide, the dosage can be reduced by about 20 per cent, and for swaths 300 to 500 feet wide the dosage can be reduced by about 10 per cent in each successive swath until a 50 per cent reduction is reached. The reduced dosage then should be repeated to the end of the plot.

There are two methods of releasing the amount of insecticide required per 100 feet. The total amount required on a front can be applied by moving the aerosol generator back and forth across this front until the material is exhausted. The second method is to calibrate the output of the generator and then calculate the proper speed to move across the front to give the desired dosage. For example: if it is desired to release 2 gallons per 100 feet from a generator with an output of 40 gallons per hour, the output per minute will be ⅔ gallon. Since 1 m.p.h. is equivalent to 88 feet per minute, the speed of movement will be

$$\frac{100}{88} \times \frac{\frac{2}{3}}{2} = 0.374 \text{ m.p.h.}$$

To prevent rapid evaporation, it is desirable that at least one-fourth of the aerosol solution be a non-volatile liquid. Best results have been obtained with a very concentrated solution. A much-used formula is 5 to 7½ lbs. of DDT dissolved in 2 gallons of benzene or xylene plus 3 gallons of SAE 10W motor oil or an agricultural oil. An agricultural oil is used where tender foliage is present. The amount of DDT that can be dissolved in the solvent depends on the temperature. Benzene is preferable to xylene.

Lindane, malathion, pyrethrum, rotenone, toxaphene, chlordane, HETP, TEPP, and nicotine have been similarly formulated. The last three insecticides are particularly noxious in aerosol form and an operator should, therefore, wear a proper gas mask when releasing them.

The initial impetus of the aerosol cloud, as it is emitted from the nozzle of the machine, should only place the cloud in the wind, and not deposit it on the foliage. The initial impetus usually is expended within 15 feet or less. It is preferable to point the nozzle low and away from the direction of travel. It should never be pointed at foliage within the range of the initial impetus, because heavy deposit might cause burning. For treating low-growing crops, the aerosols should be directed below the top of the surface inversion. When aerosols are applied in towns, the nozzle should be pointed over the tops of cars parked in the streets.★★

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NEWS BRIEFS

CAMPBELL FERTILIZER CO., Gueydan, La., has filed a charter amendment changing the corporate name of the firm to Campbell Feed and Fertilizer Co., Inc.

AC

WILLIAM CARPENTER, St. Louis district sales manager for the Columbia-Southern Chemical Corp., has been appointed assistant to the president of Pittsburgh Plate Glass Co., Pittsburgh, Pa. Columbia-Southern is a wholly-owned subsidiary of Pittsburgh Plate.

AC

WOODROW W. LAIR has been named refinery superintendent at the United States Borax & Chemical Corp.'s potash operations at Carlsbad, N.M. He had been assistant refinery superintendent.

AC

WADE HAMPTON LOGAN, founder and chairman of the board of the Logan-Robinson Fertilizer Co., Charleston, S.C., died June 28. He was 83 years old.

AC

CALVIN L. DICKINSON, director of manufacturing for the Trona, Calif., plant of the American Potash & Chemical Corp., has been given added duties as director of manufacturing for the firm's Henderson, Nev., plant.

AC

MASTER TANK AND WELDING, Dallas, Texas, has announced that O. B. Cecil has been named general manager; J. E. Stafford was named sales manager of the LPG & NH_3 department, southern division; and Fred C. Catron has been named sales manager of pressure vessels and special products division.

AC

LIN MERCIL has been appointed north central regional manager for the Panogen Co. division of Morton Chemical Co., Chicago. He has been with the company for four years as a sales representative.

AC

J. J. REPKO has been named production superintendent for fertilizers and chemicals at the Buffalo, N. Y., plant of the American Agricultural Chemical Co.

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INDEX to ADVERTISERS

Allied Chemical Corporation — Nitrogen Division ..... 67 to 70
American Agricultural Chemical Co., The 21
American Cyanamid Co. 26
American Potash & Chemical Corp. ..... 3rd Cover
Arctic Lodges, Ltd. 98
Armour Agricultural Chemical Co. 8
Ashcraft-Wilkinson Co. 6

Bagpak Division, International Paper Co. 72
Bemis Bro. Bag Co. 48
B-I-F Industries 16
Bio-Search & Development Co. 97
Bradley Pulverizer Co. ..... July

Chase Bag Co. ..... 2nd Cover
Clark Equipment Co. 24
Clupak, Inc. 9
R. D. Cole Mfg. Co. ..... June
Combustion Engineering, Inc., Raymond Division ..... July
Continental Can Co. ..... June
Commercial Solvents Corp. ..... May
Cox, Dr. Alvin 97

Davison Chemical Division, W. R. Grace & Co. 22
Diamond Alkali Co. 56
Dorr-Oliver Inc. ..... June
Duval Sulphur & Potash Co. 6

Eastman Chemical Products, Inc. 18
Escambia Chemical Corp. 85

Fairfield Chemical Div., Food Machinery & Chemical Co. ..... May
Ferro Corp. 93
Floridin Co. ..... July
Foxboro Co. ..... July
Fluid Energy Processing & Equip. Co. ..... July
Fry Co., Geo. H. 91

Geigy Agricultural Chemicals ..... May
General Chemical Division — Allied Chemical Corp. ..... June
Glendon Pyrophyllite Co. 88
Grace Chemical Division W. R. Grace & Co. ..... June

Harris Laboratories Inc. 97
Hercules Powder Co. ..... 4th Cover
Highway Equipment Co. 54
Hooker Chemical Corp. 12
Huber Corp., J. M. ..... June

Inland Chemical Corp. 99
International Minerals & Chemical Corp. 64, 65

Johns-Manville Co. 74

KLM Royal Dutch Airlines 96
Kolker Chemical Corp. ..... June
Kraft Bag Co. 13

Magnet Cove Barium Co. ..... July
Mine Safety Appliances Co. 94
McDermott Brothers Co. ..... July

National Aniline Division — Allied Chemical Corp. ..... June
Niagara Chemical Div., Food Machinery & Chemical Corp. 42
Nitrogen Division — Allied Chemical Corp. ..... 67 to 70

Penick & Co., S. B. ..... Apr.
Phelps Dodge Refining Corp. 25
Piper Aircraft Corp. ..... July
Plibrico Co. 82
Potash Company of America 3
Poulsen Co. ..... July
Prentiss Drug & Chemical Co. ..... June
Raymond Division, Combustion Engineering, Inc. ..... July

Reideburg, Theodore Associates 97
Renneburg & Sons Co., Edw. ..... July
Republic Steel Corp. 78
Rohm & Haas Co. ..... Feb.

Sauchelli, Vincent 97
St. Regis Paper Co. 80
Scientific Associates, Inc. 97
Shell Chemical Co. ..... July
Scott Paper Co. Hollingsworth & Whitney Div. 20
Snell, Foster D., Inc. 97
Sohio Chemical Co. 15
Signal Oil and Gas Co. Houston Division ..... July
Southeastern Clay Co. ..... June
Southwest Potash Corp. 14
Star Enterprises Inc. ..... July
Spraying Systems, Inc. ..... July
Standard Oil Co. (Indiana) 10
Stauffer Chemical Co. ..... May
Sturtevant Mill Corp. 7

Tennessee Corp. 60, 95
Texaco, Inc. 76
Texas Gulf Sulphur Co. 52
Townsend, Dr. G. R. 97

Union Bag-Camp Paper Co. 4
Union Carbide Plastics Co. ..... June
United Heckathorn 86
U. S. Phosphoric Products, Div., Tennessee Corp. 17
United States Borax & Chemical Corp. 19

Vanderbilt Co., R. T. ..... June
Victor Chemical Works, Division of Stauffer Chemical Co. 23
Vulcan Containers ..... June

West Virginia Pulp & Paper Co. ..... June
Wisconsin Alumni Research Foundation 97
Witco Chemical Co. ..... May
Dr. Wolf's Agricultural Labs. 97

TALE ENDS

REPORTS from the sales front indicate that most basic producers of pesticides,—and formulators too, are enjoying an excellent season, and generally passing sales totals of previous years. Pesticides have been selling in large volume for use on cotton, and the midwest market in pesticides for soil treatment has grown substantially. Fertilizer-pesticide mixtures have moved this season in increasing quantities. One of the dull spots in the market, we are told, has been sale of miticides in the far west. Here the market has slumped, primarily because the mites simply haven't been present in the normally large numbers.

AC

There has been a major increase this season, our agents tell us, in the use of fertilizer-herbicide mixtures. A number of the major producers of basic herbicides report that there has been a big demand for these combination products, for use particularly on turf. The market is being studied closely, and we have a feeling that an even more aggressive effort will be made next season by herbicide producers who have up to this point been a little slow in recognizing that a rapidly growing market exists in this quarter.

AC

The U. S. Dept. of Commerce is currently sponsoring a series of meetings designed to encourage various American industries to expand their export markets. Recently representatives of the pesticide and fertilizer industries met in Washington to see what might be done to build export markets for their products. Actually, without the benefit of direct government aid in the form of some type of subsidy, we doubt there is much that the industries themselves can do. Principal stumbling blocks are the numerous trade agreements between many potential foreign buyers and the Communist countries, which bar those markets to American suppliers, and the fact that other governments subsidize such exports. It is our feeling that quite a case could be built up for the American government doing the same thing. One of the greatest contributions the U. S. could make toward relieving want in depressed countries throughout the world would be to help these backward nations acquire some of the chemical aids that have made American agriculture so productive.

AC

Fear that a 2,4-D herbicide might contaminate wheat caused quite a "scare" in Colorado recently, resulting from misinterpretation of a report that Food and Drug was collecting samples of wheat to determine if such contamination had occurred. The story, said George P. Larrick, U. S. Commissioner of Foods and Drugs, "was just a wild thing that got out of hand, without any basis in fact." Actually, he reported, "we've never been able to find a residue (from 2,4-D) in wheat." HEW Sec. Flemming endorsed this view by stating that 2,4-D does not present a health problem, since no residue has ever been found in wheat.

AC

John D. Crummey of San Jose, Calif., founder of Food Machinery & Chemical Corp., and now honorary chairman of the board, left early last month on a European vacation. He was accompanied by a party totaling 27, including all his relatives and several close friends. At a family gathering last fall someone had suggested such a trip, and in this case what so many families have had as a dream actually became a reality.

AC

One of our roving reporters advises us of a new hazard in connection with application of pesticides through a garden hose arrangement. In a mid-western state, he reports, where a highly toxic insecticide was being applied in this manner, the water carrying the insecticide backed up into the water system of the house, and a fatality resulted from drinking the contaminated water.

A TYPICAL AGRICULTURAL CHEMICALS SUBSCRIBER SAYS

Why I Read Agricultural Chemicals

E. F. SCHROEDER
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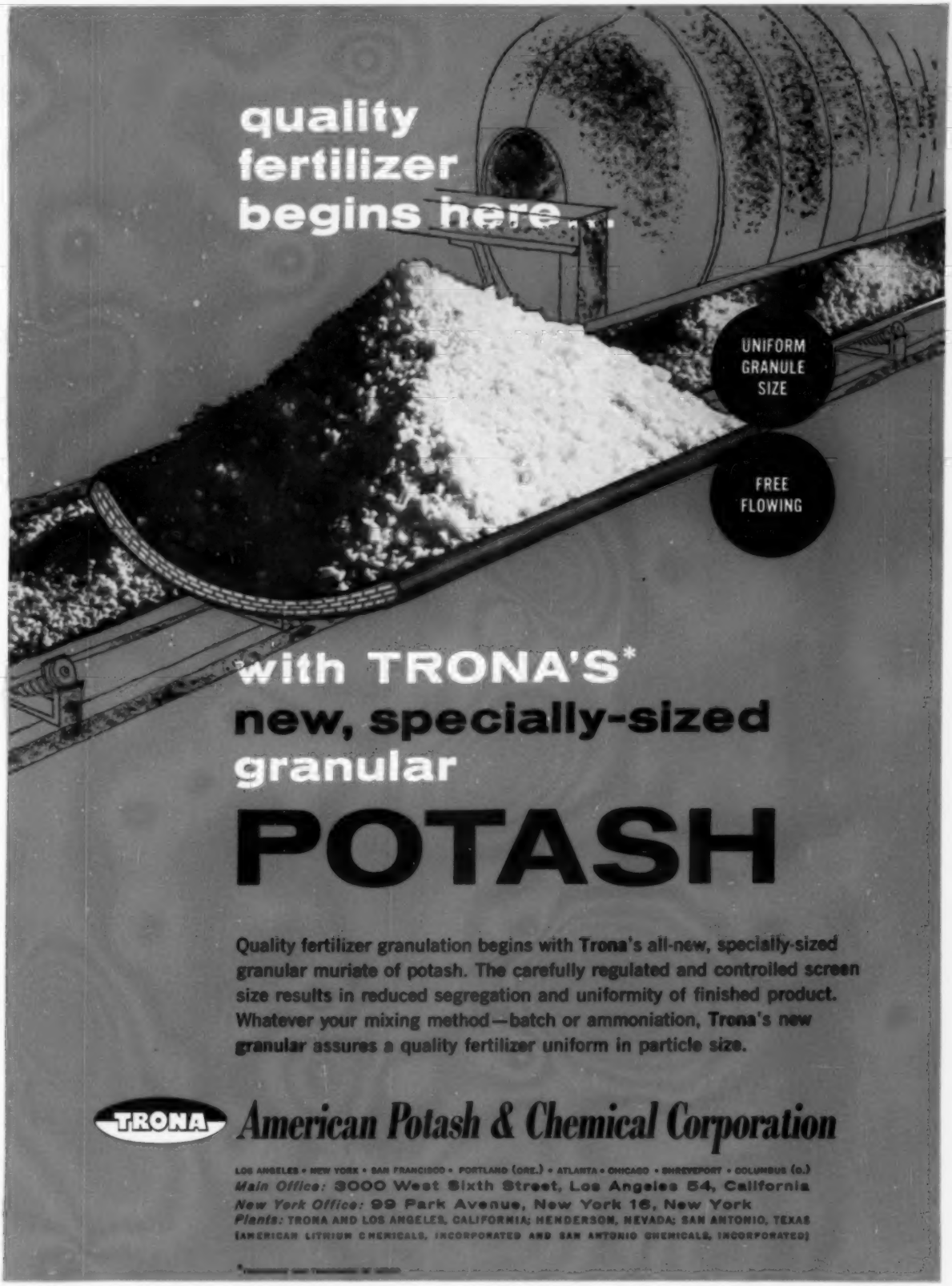

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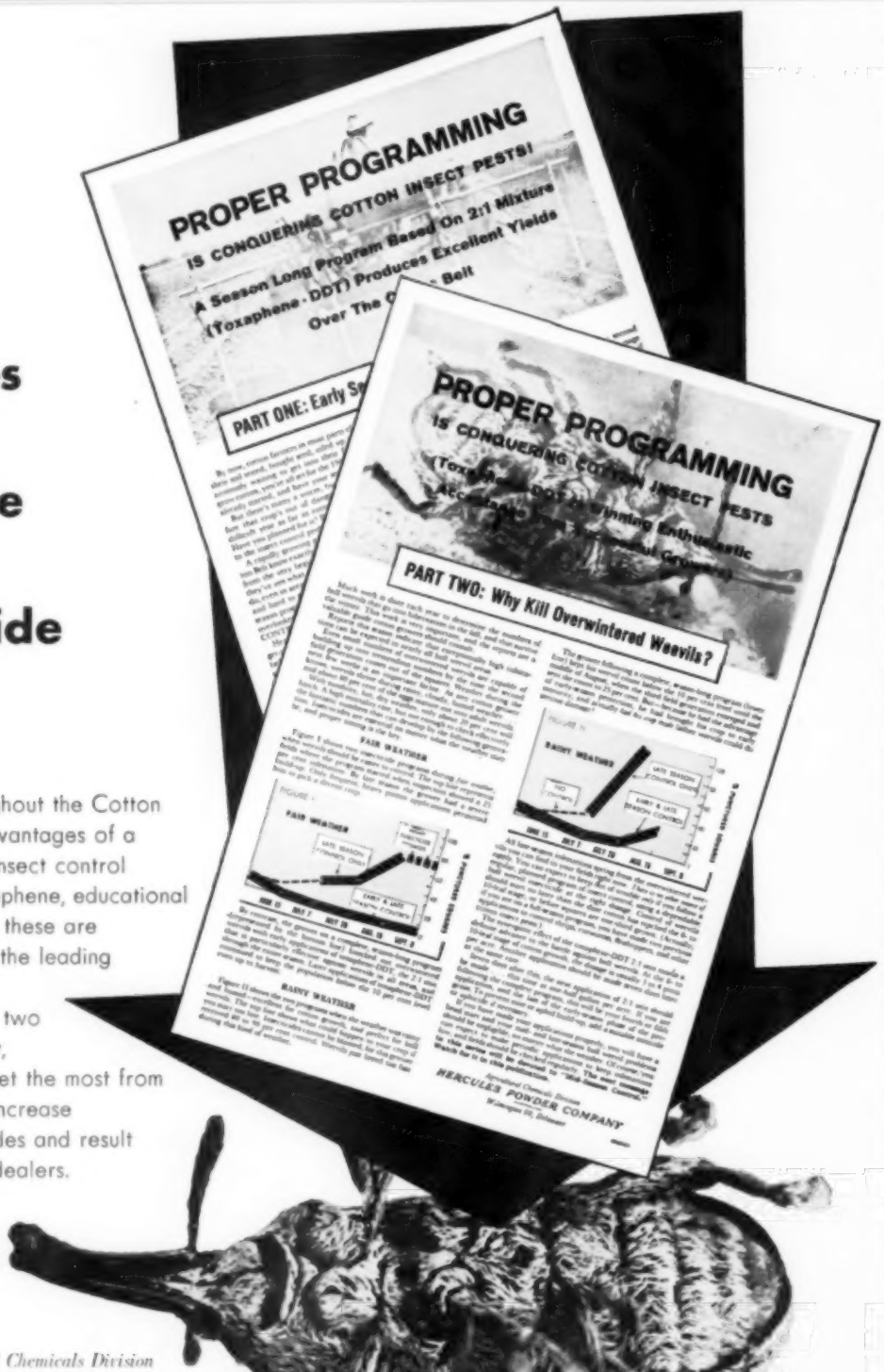

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